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Arts and Artisans at Home and Abroad: with sketches of the progress of Foreign manufactures. By JELINGER C. SYMONS, Esq., *one of the assistant Commissioners on the hand-loom inquiry, &c.*

[CONTINUED FROM VOL. XXV. PAGE 374.]

Wages and Physical Condition of Austrian and Prussian Artisans.

In Austria but few differences distinguish the condition of the artisans from those in Germany. Since the period of a former visit to Austria, some years ago, I perceived a marked progress in their prosperity; and although small comparison can be drawn between the artisans of Switzerland and Austria, still those of the latter country are far from ranking low in the scale of industrial welfare among the nations of the Continent.

The wages of the factory labourers average as follows:—Spinners, 1 fl. (1*s.* 8*d.*) per day; women, from 30 to 40 kr. (10*d.* to 2 1½*d.*) per day; children, 13 to 16 kr. (4½*d.* to 5½*d.*) per day.

The hours of factory labour in Austria are cruelly long, being frequently in the factories of the interior 15 hours per day, exclusive of meal time; and not unfrequently 17 hours. No law protects the children. At Messrs. Escher and Kennedy's, a humaner system is adopted, and the time of work seldom exceeds from 13 to 14 hours.

It appears that the fate of these unhappy children has excited some animadversion in Austria, and that the question of shortening the time of work is occupying the attention of the Government; for an association of the cotton spinners has been formed, to which, the owners of 470,000 out of the whole 600.000 spindles in the empire, already belong. The efforts of this associa-

tion are employed in using every possible means to keep the law as it is, and to maintain this flagrant inhumanity. This subject has been frequently recalled to my notice in other countries. Any remark which I might chance to make on the bad effects of not limiting the hours of infant labour in other factories, has been generally met by the remark, "We do not work our children nearly so much as in Austria." Thus the cruelty of the Austrian practice becomes a justification (though a bad one) for lesser excess over the rest of the continent.

The Wandershaft system of course prevails there; and most of the trades are supplied by the itinerant journeymen. A carpenter there can earn from 40 to 54 kr. and even a florin (1*s.* 8*d.*) per day. Millwrights ditto. The social system is very different from what it is in England or in Scotland, and it would take some time to describe it fully. In the first place, almost every father of a family has a house and several patches of land. The house and land may have cost 1200 to 1500 florins, or even less. 1200 fl. equals 100*l.* sterling, and this the proprietor has probably bought, liable to a mortgage of 600, 800, or even 900 fl.; for which he pays 5 per cent. The Voralberg, containing about 90,000 inhabitants, sends out masons and house builders to nearly the whole of Switzerland, and the neighbouring provinces of France. They leave early in spring, and live very sparingly during the summer; cooking for themselves a kind of pudding or soup of flour and Indian corn, which, with bread, and now and then a glass of wine, suffice for their nourishment. They return home in autumn, where they have little to do during winter; excepting to fell wood, &c. in the forests, and other chance work. The children leave the country at the same time in thousands, to herd cattle in Suabia and Bavaria: they get perhaps 1*l.*, besides board and lodgings, for their services, a suit of home-spun linen clothes, and two pair of shoes, and perhaps a bag of flour, which they manage to cook for themselves on the way, and return with nearly the whole of their earnings. The women who remain, and the elder men, cultivate the land, and the girls and many of the young men weave, and are employed in the manufactories.

I have before stated, that food is cheap in Austria. These are the prices of bread and meat, and wheat, as published by authority in the "Feldkircher Wochenblatt," of October 9th, the day I was at that town; *Best wheat*, 6 fl. the half "metz," of which, four make a sack; (the price of the English quarter would be, therefore, 40*s.*) *common wheat*, $2\frac{1}{2}$ fl. per half metz, (or 33*s.* 4*d.* per quarter).

Best white bread,	$1\frac{2}{5}d.$	per English lb.
Common do.	$1\frac{1}{8}d.$	Do.
Beef,	3*d.*	Do.
Veal,	3*d.*	Do.
Mutton,	$2\frac{3}{4}d.$	Do.
Pork,	4*d.*	Do.

In Austria, the working classes generally are a contented, but certainly an ill-informed people.

The means of life seem pretty equally distributed, according to the manufacturing demand for labour, or the fertility of the soil, compared with the number of the population. In the Tyrol, great poverty prevails, and this forces the natives to migrate and wander over the rest of the Continent, deriving a scanty subsistence from the sale of wares, &c.

In *Northern Prussia*, wages are not quite so high. Mechanics, as carpenters and blacksmiths, earn in the towns from 1*s.* 6*d.* to 1*s.* 10*d.* per day.

Shoemakers, tailors, &c., about 1*s.* 2*d.*: common labourers in towns 1*s.* per day in summer, and 9*d.* in winter, and in the country from 5*d.* to 8*d.* Agricultural labourers, besides house rent, fuel, and sometimes half an acre of land, earn from 5*d.* to 7*d.* per day.

The food of the working classes in Prussia does not materially differ from that of the Austrians.

In *Wurtemberg*, there are a great number of very poor people; chiefly owing, it is said, to the utter decay of the flax spinning, which, as a domestic industry, was the great trade of the Wurtemberg peasants. Weaving, and indeed all wages, have experienced a decline.

The best artisans are employed in the large towns, are fed and lodged by the masters, and receive from one to two and a half florins weekly. Those in the smaller towns and villages are lodged, fed, and receive from 20 kr. to 1 fl.; when workmen are taken on extraordinary occasions by the day, they receive from 20 to 30 kr., and are fed. Farmers hire their servants by the year, feed and lodge them, and give them in the villages from 20 to 40 fl., in the towns from 50 to 60 fl. yearly wages.

In the morning, they eat soup, potatoes, or bread; dinner, vegetables or pudding; between dinner and supper, bread; supper, potatoes and milk, or soup; once or twice a week, meat. In the cold weather, the man would have a glass of inferior brandy before going to work in the morning. On Sundays, the man would have a little beer or wine, and the woman coffee, of which they are very fond.

A journeyman workman in the country, with the shoemakers and tailors, 20, 24 to 30 kr.;* with the bakers, 48 kr. to 1 fl.; with the smiths, 48 kr. to 1 fl. 12 kr.; with calenderers and tanners, 48 kr. to 2 fl. weekly, with board: a journeyman carpenter, or bricklayer, from 30 to 36 kr. daily, with bread and something to drink. In the capital, with board, from 1 fl. 12 kr. to 2 fl. 42 kr. weekly; without board 36 kr. to 1 fl. daily.

It is astonishing how far these wages go. Day labourers even can save a great part of their earnings. They are well fed, when boarded by their employer; receive in towns, in the morning, coffee, 2 kr. worth of white bread, or, instead of the coffee, a quart of cider and a pound of bread; at dinner, every day, vegetables and meat; in the evening, soup, potatoes and two ounces of butter; in some trades they have, besides, a quart of cider and bread.

The country labourers also, in some places, live well. The return to the Poor Law Commissioners' Inquiry, states, that in the district called *Auf der Bahr*, for instance, every day labourer regularly kills a hog every year, either alone or in conjunction with others, and has meat through the winter. In the Black Forest every woodcutter in like manner constantly eats meat, drinks wine, and in general denies himself nothing. Other day labourers, who have fewer opportunities of obtaining constant work, or who have large families, must indeed live more frugally. A poor woodcutter at Delmensingen, in the bailiwick of Wiblingen, for instance, puts in the morning, a slice of bread in his pocket, and is happy if he can drink a small glass of brandy with it, and in the evening finds a dish of warm vegetables when he comes home; during the whole week he does not taste meat, and often not even on Sunday. A poor tailor at Saugau, whose business does not afford him the means, supports by day labour himself, his wife and eight children, who, on account of their youth or attendance at school, can earn little or

* 60 kreutzers make 1 florin = 1*s.* 8*d.*

nothing; that is, ten persons, without incurring debts and without support from others, except perhaps a few articles of clothing which are given them as presents. The work on which he is employed is chiefly woodcutting and *stumpengraben*, by which he earns, one day with another, at the most, 24 kr. or 120 fl. per annum. These people take, in the morning, soup; when the man goes into the forest, he takes with him brandy to the value of $1\frac{1}{2}$ kr. and black bread, for 2 kr., and in the evening sups with his family, who, during the day, have had potatoes, or *garlic* and herbs, or some other vegetable, or perhaps potatoes again. These people taste meat at the most sometimes on Sundays; never wine or beer.

The prices of food are extremely low in Wurtemberg: coarse meat costs on an average 8 kr. per lb.,$=2\frac{2}{3}d.$, bread from 3 to 4 kr.,$=1\frac{1}{3}d.$ per lb.

A Review of Wages.

As the amount of commodities purchasable with the same sum of money on the Continent, is much greater than the amount purchasable with it in England, various calculations have been made of the proportionate difference; but as this amount of commodities differs not only between countries but between towns and districts in the same countries, I regard as of very little use any statement of one general measure of a difference, which I have found to vary with the price of food, the fluctuations of markets, the inequality of seasons, and the political circumstances of the countries, from a difference of 5 per cent., to a difference of 100 per cent. It is necessary to specify the place in each country, and the time at which the comparison is to be made, in order to arrive at any thing like a correct ratio of the proportionate value of the same sum at those places. As a general proportion (subject, however, to large variations,) we may perhaps assume that in Switzerland 1*s.* will go as far for a working man as 1*s.* 3*d.* here; in France, Belgium, Rhenish Prussia, as far as 1*s.* 4*d.* here; in Austria, and many parts of Prussia, as far as 1*s.* 5*d.* here; and in Wurtemberg, parts of Austria, some of the Duchies, and Bohemia, as far as 1*s.* 8*d.* or 1*s.* 10*d.* here; always comparing towns with towns, and country with country; agricultural with agricultural districts, and manufacturing with manufacturing districts. Hereafter, of course, in using the term wages, I mean *real* wages, that is, *amount of commodities* purchasable with the money.

It will be seen that one of the most salient features of difference between home and continental wages, consists in the fact, that, whilst very great disparity exists between the rates of payment in the different departments of labour at home, an uniformity prevails abroad, varied alone by the variations of skill required, and by the local demand for and supply of labour. It will be further observed, that the branches of industry which are higher paid with us than abroad, such as spinners, tailors, &c., are precisely those which are in combination among us; and that those, such as hand-loom weavers, &c., who are worse paid here than abroad, are those who have no combinations, at least none effective in maintaining the rate of wages. To this fact, I shall recur hereafter; for to the absence of combinations abroad I entirely attribute the uniformity of foreign wages. Taking a general view of the comparative pecuniary condition of the working-classes on the Continent and at home, I have no hesitation in saying, even after the difference in value of money is taken fully into account, that the working-classes of England in the aggregate, are at least by one-sixth better off than the working-classes of the Continent. Of course, this statement is subject

to very considerable exceptions, which I shall endeavor to specify; but as a general statement I make it with confidence.

The factory work-people are decidedly the best paid in England, in comparison with the same class abroad. The wages in the Lancashire factories average as I have stated 10*s.* 6*d.* per week per head. Those in France, Switzerland, Austria and Belgium, vary from 6 fr. to 9 fr., averaging 7 fr. 50 cent. =6*s.* 3*d.*—a sum which will, in the districts in questions, be equivalent in exchangeable or real value to 8*s.* 4*d.*; so that cotton-factory work-people of Lancashire have 26 per cent., or a quarter more wages than the same class abroad. The disparity is *less* in all other branches of industry; and the difference, with scarcely an exception, will be found to *decrease* in each branch of industry, in the same proportion in which that branch is unfortified by combinations at home;—the journeymen carpenters, tailors, shoemakers, differing in a lesser degree, the agricultural wages differing very little, and the hand-loom weavers being somewhat higher abroad.

The price of corn, and therefore of the chief articles of food, in France and Belgium, is, for instance, to the price in England, as 3 is to 4, or as nearly so during a course of years as possible. Taking this as a groundwork, I have sketched the following proportion between real wages, in the chief divisions of industry in the two countries :—

Classes of Labourers.	In France and Belgium, Average Weekly Wages.	In England, Average Weekly Wages.	Difference in favour of England, after adding one-third for greater cost of food.
	fr. cent. *s. d.*	*s. d.*	*s. d.*
1st Class of Mechanics.	15 =12 06	20 00	3 04
2d do. do.	10 80 = 9 00	14 00	2 00
Farm Labourers.	7 80 = 6 06	10 00	1 04
Spinning Factory do. men, women, and children.	7 50 = 6 03	10 06	2 02

In Switzerland, the paradise of the labouring classes, where the father of almost every family is a proprietor of land, the condition of the working-classes cannot be tested by wages, and their high physical, as well as moral eminence, places them far above the standard of comparison with any other people of Europe. In France, wages I consider are, generally speaking, as low if not lower than in most countries; and the people live in a state of discomfort, which I have not seen surpassed, except in portions of the most impoverished parts of Austria and Wurtemberg.

The comfort of the cottages in England is not equalled abroad, Switzerland excepted. In Belgium there is more cleanliness than in France; the pigs and poultry have not the same prescriptive right to inhabit the bedrooms, which they possess by immemorial usage in most other countries. In Austria the physical comfort of the working classes is a little superior to that of the French. I have compared these countries with England, in

distinction from Scotland, where I found every thing, as regards the country especially, so closely resembling the scenes, practices and manners of the Continent, especially Germany, that I regard it in these respects on a par with Prussia.

The Mental and Moral Condition of the Artisans Abroad.

In education Belgium is decidedly deficient: about one-third of the children are wholly ignorant. The schools are of three classes, viz. communal, *mixte*, and private. The first are schools supported by the local municipal funds; *ecoles mixtes* are also communal schools, but which derive aid or subsidy from the Government or the province. About 400,000 children are receiving education out of a population of 4,250,000, the average being one child educated to 10.7 of the population.

The following table presents a relative view of the education, criminality, poverty, density of population, proportion of town to country inhabitants, gross population, births and deaths, in each of the nine provinces of Belgium. I have carefully collated it from state documents.

Provinces.	Inhabitants to every one Child at School.	Inhabitants to every one Person accused of Crimes.	Number of indigent Poor to ev'ry 100 Inhabitants.	Number of Country Inhabitants to every one in Towns.	Inhabitants to ev'ry 100 Hectares.*	Total Births in 1836.	Total Deaths in 1836.	Gross Population in 1836.
Namur	6.8	6,369	4.4	5.80	62.5	7,554	4,268	227,074
Luxemburg	7.1	8,407	0.7	6.59	47.8	11.752	7,421	323,219
Brabant	9.4	5,924	21.1	2.60	180.4	21,319	15,536	592,250
Hainault	9.5	17,111	21.3	3.79	175.4	21,192	13,432	631,823
Anvers	9.7	6,138	7.9	1.90	126.8	7,493	8,482	360,180
Limburg	10.2	5,924	10.0	4.16	76.9	9,219	7,598	331,305
E. Flanders	12.6	5,734	13.3	3.10	253.2	24,090	17,933	758,906
W. Flanders	13.9	6,686	20.1	2.76	191.0	21,586	16,689	627,128
Liege,	16.2	5,440	17.2	3.09	135.4	14,372	9,875	390,715

The average of children at school was less favourable in 1833, when the census gave 11.3 inhabitants to every child at school. The year chosen for the preceding table was 1836. Namur and Luxemburg presented the largest amount of education in 1833, and the two Flanders the least. There are several infant and adult schools in Belgium, conducted on a very efficient scale.

It will be perceived that Liege presents the most ignorance, the most crime, and nearly the greatest proportion of paupers. It is singular that Liege, together with Brabant and Hainault, are the richest provinces, and those where wages are the highest! If I attempted to explain this, I should say that it arose more probably from the culpable indifference to the morals and minds of the people, on the part of those who are at the head of large establishments, in more than one of the districts in question. However this may be, I have always found that high wages, without a pro-

* Nearly two and a half acres each.

portionate mental training, were invariably attended with increased immorality, imprudence, and frequently with positive want.

The Progress of the Manufacturing Arts Abroad, as regards Machinery.

Machinery is the main agent of manufactures, and no surer index of the progress of the latter can be adduced than the advances of the former. I am, I confess, not among the number of those who magnify the relative importance of the *existing* circumstances and extent of foreign competition; but I should be wilfully blind to the plainest evidences of the truth, were I to conceal that there are symptoms throughout the Continent of a prospective, and by no means a remote, rivalry with this country in the chief of those arts of production and elements of commerce in which England has heretofore maintained a perfect and facile pre-eminence. The peril to this country is to be measured not by present competition, but by the magnitude of the preparations, and the germs of a progress which is as yet confined to a promising and vigorous infancy, evidenced chiefly by the rapid increase of machine-making establishments, to a slight description of which I shall devote this chapter.

Belgium, from her mineral riches and other topographical facilities, naturally takes the lead in the progress of Continental machinery. I have already alluded to the leviathan establishment of Mr. John Cockerill at Seraing, employing 3000 workmen, with seven skilful English engineers superintending the chief departments, and combining English skill with the advantages of cheap labour. The motive power consists of steam-engines of 900 horse power; and Mr. Cockerill not only supplies machinery to all parts of the Continent, but has branch establishments in three different countries. In addition to spinning machinery of every description, steam-engines, both stationary and locomotive, are supplied to France, Germany and Russia.

It is difficult to name any large enterprise of manufacturing industry, whether in Belgium, Holland, Russia, or the immense territory of the Prussian league, with which Mr. Cockerill is unconnected, either as a shareholder or as the engineer from whom the machinery emanates. He has spinning-mills of flax, or cotton, or wool, in almost all the chief districts for these manufactures in the Prussian or Belgian dominions. Mr. Cockerill's name is on all the locomotive* engines on the Belgian railroads, and I was told that he is the contractor for those now forming in Russia.

When we remember that Mr. Cockerill's father, who established this gigantic concern, came over to Belgium a common blacksmith, and could neither write nor read, I believe, till the day of his death; when we further consider that the machinery he turns out is, after all, of secondary reputation for quality, and extremely dear, we may form some idea of the power and magnitude of the natural advantages Belgium affords to the manufacture of machinery, and which may be reckoned as the multiplier of all her other productive powers.

Mr. Cockerill, extensive as are his enterprizes, by no means monopolizes the making of machinery. Of those now commencing there are the Messrs. Fairburn, who have issued prospectuses of an establishment, which was to be formed at the large factory already built at Malines, near the

* A. D. 1837.—C. P.

railroad station. Mr. William Fairburn is to superintend the heavy department for engines, locomotives, &c., and Mr. Peter Fairburn that for spinning-machinery, and especially for flax spinning. There can be no question that this establishment will rival any in England. In addition to these is the company of the Phenix at Gand, on a very large scale, and in which English and Scotch engineers are already engaged. There is likewise another at Brussels, of the existence of which some mystery is made. I owe the knowledge of it to Sir Hamilton Seymour, who kindly accompanied me to see it, and owing to his good offices we obtained the unusual favour of being allowed to inspect the interior. It is of large dimensions, covering 2½ bonniers of about 6500 square feet each. This establishment belongs to one of the *Sociétés anonymes*, of which the Banque Nationale is said to be at the head. 500 workmen, of nearly all nations except France, whose operatives are not in repute in Belgium, are employed. Some of Sharp and Robert's machinery was there. The present motive power is not above 36 horse.

There are several old established machine-makers in different towns in Belgium, but few on the same scale as those I have named. The fact is, that this industry is yet in the first stage only of its development. Mr. Cockerill told Sir Hamilton Seymour, that he had all the new inventions over at Seraing ten days after they came out in England.

There is but one chance of an obstacle to the career of Belgium in her manufacturing progress of competition with England, and that one Her Majesty's Government have recently, no doubt with the best intentions, used their best exertions to remove, exertions which have met with the best reception and success on the part of Belgium. I allude to the decreasing stock and increasing price of coal in that country. The following table of its rapid rise in price is extracted from statistical government returns.

	1836.	1837.
Mons,	7 and 8 fr. per tonne.	12 and 14 fr. per tonne.
Charleroi,	13 and 14 fr. id.	18 and 19 fr. do.

Prior to 1836, Mons coal was 8 fr. per tonne at the *maximum*. It has risen in price again since last year; and the Belgian Government have consequently assented to the prayer of the English Government, to be allowed to supply them free of duty.

By France a similar *boon* has been granted to the coal-owners in England, and I need hardly say that the Belgian and French manufacturers are overjoyed at the concession.

The iron-works have made equal progress in Belgium.

In 1837, there were 23 high furnaces of coke, and 66 of charcoal, in Belgium; 20 new furnaces of coke are either completed or being erected since that period. On the plain of Selessin near Liege, a company are erecting six of a colossal magnitude, which, when finished, will be the largest on the Continent.

The quantity of iron founded in the year in Belgium was estimated at 150,000 tonnes (or about 147,640 English tons.) It is now increased.

The following are the current prices of iron per *tonne*.

	1st Quality.	2d Quality.
1830,	465 fr.	390 fr.
1832,	412 fr.	322 fr.
1834,	393 fr.	304 fr.
1836,	413 fr.	324 fr.

In France, machine-making is proceeding with considerable rapidity. Mr. Dyer of Manchester has established his son at Blangy, not far from Abbeville, and there are many French competitors. There is one especially at Reims, who turns out excellent machinery, and many at St. Etienne.

At Zurich in Switzerland, there is a first-rate establishment of this sort, where iron steam-boats, down to the finest spinning machinery, are manufactured. There are nearly 700 workmen employed here, and 7 are English foremen. Mr. Escher, who is one of the first and most scientific industrialists of the Continent, is at the head of this establishment, and, like Mr. Cockerill, is also the proprietor of several flourishing steam-factories, some paper-mills, and some weaving and some spinning-mills, not only in Switzerland, but in Piedmont, Savoy, the Tyrol, and Wirtemburg, where he is about to erect a flax-factory. Mr. Peter Kennedy, late of Manchester, is in partnership with him, and superintends the Austrian mills. New inventions are frequently made. For instance, I saw a roller introduced at the end of the carding-frames, round which the cards are wound, and which dispenses entirely with the pans, and consequently with a great number of hands still employed in most, if not in all, of the English mills. Again, they are enabled to unite the separate advantages of different patents in England; and at Mr. Escher's factory in Zurich I saw a combination of the self-acting mules severally produced by Sharp and Roberts, and Mr. Smith of Deanston, and which their patents prevent our combining in England.

Many of the foreign mechanics, who have not an equal skill in the invention or improvements of machinery, directly pirate the productions of English skill. An English gentleman told me he had assisted in putting together some new machinery in Italy, which had been cast in moulds formed from some smuggled machinery of the Messrs. Crichton, with their name and the word Patent cast on it.

At Vienna the emperor has a large establishment under his immediate patronage, and an Englishman of the name of Thomson is one of his chief superintendents. The Emperor of Russia has very large foundries and spinning-factories at Alexanderoffsky, with a General Clark at the head of the foundry, and a Mr. Wilson of the factories, and at Colpenny with several English workmen. Wilson, brother of the above named, is the foreman or superintendent at St. Petersburg; the foundry is chiefly for cannon. John Isherwood, formerly of Leeds, is at the head of another establishment called Waybugskey, a part of the capital.

The following information on the denizen mechanical skill in Poland is from a perfectly authentic source.

A large mill, having sixteen pair of mill-stones, moved by steam-power, and lighted with gas, was erected at Warsaw some years ago. It was at first managed by a native of France, under whose management it did not succeed. For the last six years, a Mr. Kedslie, mill-factor from Leith, has been the superintendent, and he has taken out two millers and their families from the mills on the water of Leith; the mill is now working day and night, and succeeding well. All parties concerned there are said to be much pleased that the bill to grind bonded grain has been thrown out by the British House of Commons. They fear nothing so much as British capital, machinery, and skill, to compete with them. John Douglas and nephew from Edinburg, established thrashing-machines and paper-mills in Poland, and have now settled as paper-mill proprietors in that country.

Since the last rebellion in Poland, James Garvie and Son, also Thomas Garvie, shawl manufacturers from Edinburgh, have succeeded in establishing a shawl manufactory thirty miles from Warsaw, upon the estate of Count Lubenski, President of the Board of Trade there: the factory consisted of thirty looms in the month of September, 1836. This same Count has erected a spinning-mill for flax, 300 feet long, 100 feet wide, 3 flats in height, and has 200 looms at work, weaving table-cloths, toweling, and linens; also thirty shawl looms, in the month of September, 1836. The yarn all spun by his own mill.

Thomas Garvie has engaged to be his overseer for the weaving department, and left the shawl factory to his brother James and Son, who are doing well.

Mr. Prichard from Edinburgh, now engineer to the Government zinc mines in Poland, was in Scotland two years ago, at which time he engaged a bleacher from Perthshire, who has commenced bleaching to the above establishment. This is the first attempt at bleaching in Poland.

Mr. George Blackie, engineer, from Edinburgh, is now employed on canals and public roads by the Government of Poland.

At Prussian Bohemia, at Aix in Prussia, and in Saxony at Chemnitz, there are also machine-making establishments. In fact, they are rising in all parts of the Continent with a rapidity, and to an extent, very far disproportioned either to the growth of the population or to the progress of preceding years. (TO BE CONTINUED.)

Physical Science.

The Committee on Meteorology have received from their correspondent at Lancaster, the following complete summary of observations for the year 1839. As it is a paper of much interest to meteorologists, it is presented to the readers of the Journal entire; and other observers are invited to furnish similar condensed statements for publication.—COM. PUB.

Meteorological Journal for the year 1839, *kept at the Lancaster Conservatory of Arts and Sciences, Lancaster, Pennsylvania; by* WASHINGTON L. ATLEE, M. D., *Observer.*

Remarks.—The Thermometers are all graduated by Fahrenheit's scale. The Barometer, Thermometers, and Rain Gauge are 5 feet from the ground. The wet-bulb Hygrometer is a common Thermometer, whose bulb is enveloped in a white cotton rag, made wet and fanned in the air. The Dew-point is ascertained sometimes by means of a tumbler of cold water, and sometimes by calculation from the wet bulb Hygrometer. The sky is called entirely clear when no vestige of cloud can be seen; entirely cloudy when no vestige of sky can be seen; and partly clear when both sky and clouds can be seen. The direction of the wind is ascertained by vanes and by smoke. The N. N. E. winds are placed under the general head of N. E. The N. N. W. under N. W. The S. S. E. under S. E. And the S. S. W. under S. W. The force of the wind, although regularly noted, is not given in this table. The direction of the clouds is always noted when it can be ascertained. Sometimes a stratum of clouds is so uniform and unbroken that no movement can be detected, and at night their direction can seldom be discovered. The force of the clouds' motion is also regularly noted, but not given in the above table.

Lancaster, May 4, 1840. WASHINGTON L. ATLEE, M. D., Observer.

Meteorological Journal for 1839, kept at the Lancaster Conservatory of Arts & Sciences, Lancaster, Pa., by WASHINGTON L. ATLEE, M. D.

Meteorological Journal for 1839, kept at the Lancaster Conservatory of Arts & Sciences, Lancaster, Pa., by WASHINGTON L. ATLEE, M. D., *Obs.*

		Barometer.			Thermometer.					Hygr'm'tr, 2 P.M.			Sky.				Winds.			Clouds.			Rain.
		7 A.M.	2 P.M.	9 P.M.	7 A.M.	2 P.M.	9 P.M.	Reg'r.	Mean.	Dew point.	Diff. b.t dew pt. &therm.	Wet bulb		7 A.M	2 P.M	9 P.M		7 A.M	2 P.M	9 P.M	7 A.M	2 P.M	9 P.M	Rain Guage Inches
														Days	Days	Days		Days	Days	Days	Days	Days	Days	
JANUARY.	Average	29.53	29.52	29.55	23.22	34.11	26.98	21.19	27.62	24.82	9.22	31.58					N.	1	1	1	1	1	0	
																	N. W.	7	10	12	12	8	4	
	Maximum	30.28	30.32	30.24	46.00	58.50	41.00	34.00	46.25	52.93	20.60	55.50	Ent. clr	3	5	10	N. E.	8	8	8	0	0	0	
																	S.	2	0	1	1	1	0	
	Minimum	28.89	28.56	28.78	–2.25	12.00	5.50	–2.25	10.625	–8.60	0.00	10.00	Ent.cld	15	13	14	S. W.	8	5	2	1	2	2	
																	S. E.	4	7	6	1	0	1	
	Range	1.29	1.76	1.46	48.25	46.50	35.50	36.25	35.625	61.53	20.60	45.50	Prt. clr.	13	13	7	W.	1	0	0	1	9	0	
																	E.	0	0	1	7	0	0	
Omitted																					6	8	14	5.143
FEBRUARY.	Average	29.58	29.54	29.56	27.26	39.07	30.21	25.78	31.89	29.43	9.00	35.88					N.	1	1	2	0	0	0	
																	N. W.	6	7	6	6	9	1	
	Maximum	29.90	29.85	29.92	38.50	54.50	41.00	36.50	42.75	51.59	24.95	46.00	Ent.clr.	8	2	16	N. E.	9	4	6	1	0	0	
																	S.	0	1	0	0	0	0	
	Minimum	28.96	28.68	28.71	8.00	18.50	13.00	8.00	13.25	–5.60	0.00	15.00	Ent.cld	7	9	8	S. W.	7	6	7	3	4	2	
																	S. E.	5	7	7	1	1	0	
	Range	.94	1.17	1.21	30.50	36.00	28.00	28.50	29.50	57.19	24.95	31.00	Prt. clr.	13	17	4	W.	0	1	0	7	6	2	
																	E.	0	1	0	0	0	0	
Omitted																					3	7	8	3.885
MARCH.	Average	29.51	29.49	29.51	35.76	50.14	39.84	32.71	41.437	32.63	17.65	42.27					N.	3	1	2	1	3	0	
																	N. W.	11	5	7	5	6	1	
	Maximum	30.04	30.03	29.92	61.00	79.00	59.00	57.00	67.00	47.44	48.21	60.00	Ent.clr.	11	11	19	N. E.	1	3	1	0	1	0	
																	S.	4	2	0	1	0	0	
	Minimum	29.07	28.89	28.95	10.00	23.00	14.00	9.75	16.375	7.55	0.00	20.00	Ent. cld	6	6	5	S .W.	5	6	4	1	0	1	
																	S. E.	3	4	4	1	1	0	
	Range	.97	1.14	.97	51.00	56.00	45.00	47.25	50.625	39.89	48.21	40.00	Prt. clr.	14	13	4	W.	0	0	2	7	5	2	
																	E.	0	0	0	0	0	0	
Omitted			1	3		1	3		1	2	2	1			1	3		4	10	11	6	5	5	1.006

Meteorological Journal—Continued.

		Barometer.			Thermometer.					Hygr'm'tr, 2 P.M.			Sky.				Winds.				Clouds.				Rain.
		7 A.M.	2 P.M.	9 P.M.	7 A.M.	2 P.M.	9 P.M.	Reg'r.	Mean.	Dew point.	Diff. bet. dew pt. & therm.	Wet bulb.		7 A.M Days	2 P.M Days	9 P.M Days		7 A.M Days	2 P.M Days	9 P.M Days	7 A.M Days	2 P.M Days	9 P.M Days	Rain Guage Inches
April.	Average	29.50	29.47	29.47	47.04	65.53	53.27	43.10	54.22	43.62	21.71	54.02					N.	2	3	4	3	3	0	
																	N. W.	8	7	6	4	2	2	
	Maximum	29.81	29.78	29.78	59.00	78.50	65.00	56.75	64.375	59.83	35.21	66.00	Ent. clr	11	12	13	N. E.	7	6	5	1	1	0	
																	S.	2	4	4	0	0	0	
	Minimum	28.88	28.94	28.89	31.50	44.00	39.00	29.50	41.25	26.40	0.00	43.50	Ent. cld	11	5	8	S. W.	7	6	7	2	2	1	
																	S. E.	1	0	0	1	1	0	
	Range	.93	.84	.89	27.50	34.50	26.00	27.25	23.125	33.43	35.21	22.50	Prt. clr.	8	13	9	W.	0	2	1	2	5	1	
																	E.	3	2	2	0	0	0	
Omitted																				1	6	4	13	6.030
May.	Average	29.44	29.43	29.42	56.77	71.89	61.32	53.84	62.88	48.34	22.83	60.21					N.	1	2	1	0	0	0	
																	N. W.	8	8	6	8	7	2	
	Maximum	29.68	29.68	29.67	69.50	84.50	72.50	65.50	74.00	67.48	43.49	72.00	Ent. clr	7	5	15	N. E.	3	4	4	0	0	0	
																	S.	2	3	4	0	0	0	
	Minimum	29.05	29.04	29.07	40.50	57.50	48.00	37.00	50.50	19.32	3.08	45.00	Ent. cld	5	4	8	S. W.	9	4	7	6	4	2	
																	S. E.	2	4	5	1	3	1	
	Range	.63	.64	.60	29.00	27.00	24.50	28.50	23.50	48.16	40.41	27.00	Prt. clr.	19	21	8	W.	2	5	3	10	10	4	
																	E.	4	1	1	1	0	0	
Omitted			1			1			1	3	3	3			1						2	2	8	3.175
June.	Average	29.42	29.42	29.42	60.65	72.06	63.89	58.12	65.13	58.28	13.47	63.77					N.	4	4	3	1	1	0	
																	N. W.	9	9	8	9	11	1	
	Maximum	29.67	29.68	29.69	71.50	84.00	76.00	71.50	75.50	73.32	24.09	75.00	Ent. clr	7	2	10	N. E.	3	2	3	2	2	0	
																	S.	3	3	3	1	1	0	
	Minimum	29.16	29.19	29.16	50.00	57.25	53.00	49.00	53.125	46.14	0.00	54.00	Ent. cld	8	9	9	S. W	5	9	5	5	2	2	
																	S. E.	2	1	4	1	3	0	
	Range	.51	.49	.53	21.50	26.75	23.00	22.50	22.375	27.18	24.09	21.00	Prt. clr.	15	18	11	W.	4	1	4	7	9	4	
																	E.	0	1	0	0	0	0	
Omitted			1			1			1	1	1	1			1						1		13	4.630

		Barometer.			Thermometer.					Hygr'm'tr, 2 P.M.			Sky.				Winds.			Clouds.			Rain.
		7 A.M.	2 P.M.	9 P.M.	7 A.M.	2 P.M.	9 P.M.	Reg'r.	Mean.	Dew point.	Diff bet. dew pt. & therm.	Wet bulb.		7 A.M Days	2 P.M Days	9 P.M Days		7 A.M Days	2 P.M Days	9 P.M Days	7 A.M Days	2 P.M Days	9 P.M Days	Rain Gauge Inches
July.	Average	29.49	29.48	29.48	69.55	81.30	71.14	66.14	73.88	65.73	15.52	70.79					N.	5	1	3	1	1	2	
																	N. W.	11	8	4	6	7	3	
	Maximum	29.78	29.77	29.76	77.50	91.00	79.00	75.25	79.625	77.48	28.24	79.50	Ent. clr	10	0	8	N. E.	0	0	3	0	0	0	
																	S.	7	5	6	0	1	0	
	Minimum	29.20	29.17	29.16	61.00	70.50	63.00	56.00	63.50	50.76	0.00	60.00	Ent.cld	4	3	6	S. W.	7	10	9	3	3	1	
																	S. E.	0	2	3	1	1	0	
	Range	.58	.60	.60	16.50	20.50	17.00	19.25	16.125	26.72	28.20	19.50	Prt. clr.	14	25	13	W.	0	5	2	10	15	3	
																	E.	1	0	0	0	0	0	
Omitted														3	3	4				1	3	4	14	2.608
August.	Average	29.52	29.51	29.53	66.23	77.43	68.38	63.04	70.44	61.54	12.32	68.48					N.	1	1	1	2	1	0	
																	N. W.	7	3	4	2	5	2	
	Maximum	29.77	29.76	29.74	74.50	87.00	79.00	73.00	80.00	76.24	26.16	78.00	Ent. clr	6	1	7	N. E.	11	9	9	3	4	0	
																	S.	1	2	3	2	2	2	
	Minimum	29.13	29.24	29.19	53.50	58.50	57.00	50.50	56.75	51.79	0.00	55.00	Ent.cld	9	4	5	S. W.	4	5	5	5	8	4	
																	S. E.	3	3	3	2	3	2	
	Range	.64	.52	.55	21.00	28.50	22.00	22.50	23.25	24.45	26.16	23.00	Prt. clr.	16	25	17	W.	2	3	0	5	6	1	
																	E.	1	2	3	2	0	1	
Omitted			1			1			1	2	2	2			1	2		1	3	3	3	3	12	3.135
September.	Average	29.53	29.51	29.53	57.08	73.30	62.00	54.69	63.66	57.72	13.91	63.99					N.	3	1	1	1	1	0	
																	N. W.	6	8	6	2	4	1	
	Maximum	29.82	29.83	29.83	76.00	86.00	75.50	74.00	80.00	75.14	24.61	76.50	Ent. clr	14	5	15	N. E.	3	4	4	0	1	0	
																	S.	1	2	1	0	2	0	
	Minimum	29.20	29.18	29.24	40.50	55.00	40.00	38.00	47.50	37.81	1.36	47.50	Ent.cld	4	3	6	S. W.	11	10	9	6	3	1	
																	S. E.	3	2	4	1	1	0	
	Range	.62	.65	.59	35.50	31.00	35.50	36.00	32.50	37.33	23.25	29.00	Prt. clr.	12	22	7	W.	3	3	3	6	12	1	
																	E.	0	0	0	1	1	0	
Omitted				2			2									2				2	1	1	12	3.198

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		Barometer.			Thermometer.					Hygr'm'tr, 2 P.M.			Sky.				Winds.				Clouds.				Rain.
		7 A.M.	2 P.M.	9 P.M.	7 A.M.	2 P.M.	9 P.M.	Reg'r.	Mean.	Dew point.	Diff. bet. dew pt. & therm.	Wet bulb.		7 A.M Days	2 P.M Days	9 P.M Days		7 A.M Days	2 P.M Days	9 P.M Days	7 A.M Days	2 P.M Days	9 P.M Days	Rain Gauge Inches
October.	Average	29.69	29.66	29.67	49.56	67.07	54.97	47.48	57.278	51.97	14.97	58.68					N.	5	3	3	2	3	0	
																	N. W.	3	3	5	2	6	0	
	Maximum	30.09	30.09	30.08	64.00	80.00	69.00	60.00	69.00	67.52	28.70	69.00	Ent. clr	15	8	17	N. E.	3	5	4	2	1	0	
																	S.	4	4	6	0	0	0	
	Minimum	29.28	29.31	29.25	32.00	51.00	38.00	30.00	41.625	34.62	0.00	44.00	Ent.cld	8	5	8	S. W.	5	6	2	3	5	0	
																	S. E.	3	5	4	1	4	0	
	Range	.81	.78	.83	32.00	29.00	31.00	30.00	27.375	32.90	28.70	25.00	Prt. clr.	8	18	6	W.	1	1	2	4	5	2	
																	E.	7	4	5	0	1	0	
Omitted																					2		12	1.305
November.	Average	29.56	29.53	29.54	32.88	45.76	36.70	31.62	38.67	31.59	13.92	40.19					N.	2	2	2	0	0	0	
																	N. W.	8	9	11	5	9	3	
	Maximum	30.12	30.13	30.16	46.00	60.00	55.00	51.00	54.75	56.71	24.46	57.50	Ent. clr	8	6	10	N. E.	5	4	5	1	0	0	
																	S.	0	2	1	1	1	1	
	Minimum	28.96	28.93	28.92	14.50	25.00	19.00	14.00	19.50	5.38	0.00	21.00	Ent.cld	6	6	8	S. W.	5	4	4	5	6	0	
																	S. E.	3	3	4	2	0	0	
	Range	1.16	1.20	1.24	31.50	35.00	36.00	37.00	35.25	51.33	24.46	36.50	Prt. clr.	15	17	12	W.	5	4	3	5	5	1	
																	E.	1	1	0	0	2	0	
Omitted		1	2		1	2			2	2	2	2		1	1			1	1		3	2	15	2.230
December.	Average	29.33	29.28	29.30	31.13	39.10	31.39	27.49	34.16	30.63	8.94	36.48					N.	3	2	3	0	2	0	
																	N' W.	13	12	12	11	11	4	
	Maximum	29.66	29.61	29.65	44.00	56.00	46.00	43.00	45.75	47.50	22.39	48.50	Ent. clr	3	2	10	N' E.	9	7	8	5	3	0	
																	S.	0	2	1	1	0	0	
	Minimum	28.30	28.46	28.28	15.50	25.00	20.00	15.00	20.00	8.24	0.00	21.50	Ent.cld	16	18	16	S. W.	3	1	2	3	4	0	
																	S E.	1	1	1	0	0	0	
	Range	1.36	1.15	1.37	28.50	31.00	26.00	28.00	25.75	39.26	22.39	29.00	Prt. clr.	12	10	5	W.	2	4	4	3	2	0	
																	E.	0	1	0	1	2	0	
Omitted			1			1	1		1	3	3	3			1				1		4	6	17	3.460

Average of 1839.

Barometer.	Thermometer.	Hygr'm'tr, 2 P.M.	Sky.	Winds.	Clouds.	Rain.

		Average of 1839.											*Total of* 1839.										
		Barometer.			Thermometer.					Hygr'm'tr, 2 p.m.			Sky.				Winds.				Clouds.			Rain.
		7 a.m.	2 p.m.	9 p.m.	7 a.m.	2 p.m.	9 p.m.	Reg'r.	Mean.	Dew point.	Diff. bet. dew pt. & therm.	Wet bulb.		7 a.m Days	2 p.m Days	9 p.m Days		7 a.m Days	2 p.m Days	9 p.m Days	7 a.m Days	2 p.m Days	9 p.m Days	Rain Gauge. Inches.
1839.	Average	29.51	29.49	29.50	46.43	59.71	50.00	43.77	51.77	44.69	14.45	52.19					N.	31	22	26	12	16	2	
																	N. W.	97	89	87	70	85	24	
	Maximum	30.28	30.32	30.24	77.50	91.00	79.00	75.25	80.00	77.48	48.21	79.50	Ent. clr	103	59	150	N. E.	62	56	60	15	13	0	
																	S.	26	30	30	7	8	3	
	Minimum	28.30	28.46	28.28	–2.25	12.00	5.50	–2.25	10.625	5.38	0.00	10.00	Ent.cld	99	85	101	S. W.	76	72	63	43	43	16	
																	S. E.	30	39	45	13	18	4	
	Range	1.98	1.86	1.96	71.75	79.00	73.50	77.50	69.375	72.10	48.21	69.50	Prt. clr.	159	212	103	W.	20	29	24	67	83	21	
																	E.	17	13	12	12	6	1	
Omitted		1	7	5	2	7	6		7	13	13	12		4	9	11		6	15	18	40	40	143	39.805
		Average of Winter Months 1838–39.											*Total of Winter Months* 1838–39										
Winter, 1838–39.	Average	29.48	29.45	29.47	27.20	37.43	29.53	24.79	31.09	34.96	8.72	34.65					N.	5	2	6	1	3	0	
																	N. W.	26	28	30	29	28	9	
	Maximum	30.28	30.32	30.24	44.00	60.00	46.00	43.00	45.75	52.93	24.95	55.50	Ent. clr	14	9	36	N. E.	26	19	22	6	3	0	
																	S.	2	3	2	2	1	0	
	Minimum	28.30	28.46	28.28	–2.25	12.00	5.50	–2.25	10.625	5.60	0.00	10.00	Ent.cld	38	40	38	S. W.	18	12	11	7	10	4	
																	S. E.	10	15	14	2	1	1	
	Range	1.98	1.86	1.98	46.25	48.00	40.50	45.25	35.125	47.33	24.95	45.50	Prt. clr.	38	40	16	W.	3	8	4	11	17	2	
																	E.	0	2	1	8	2	0	
Omitted			1			1	1		1	3	2	3			1				1		11	21	39	12.488
		Average of Spring Months 1839.											*Total of Spring Months* 1839.										
Spring, 1839.	Average	29.48	29.46	29.47	46.52	62.45	51.48	43.42	52.84	41.53	20.73	52.17					N.	6	6	7	4	6	0	
																	N. W.	27	20	19	17	15	5	
	Maximum	30.04	30.03	29.92	69.50	84.50	72.50	65.50	74.00	67.48	48.21	72.00	Ent. clr	29	28	47	N. E.	11	13	10	1	2	0	
																	S.	8	9	8	1	0	0	
	Minimum	28.88	28.89	28.89	10.00	23.00	14.00	9.75	16.375	7.55	0.00	20.00	Ent.cld	22	15	21	S. W.	21	16	18	9	6	4	
																	S. E.	6	8	9	3	5	1	
	Range	1.16	1.14	1.03	59.50	61.50	58.50	55.75	57.625	59.93	48.21	52.00	Prt. clr.	41	47	21	W.	2	7	6	19	20	7	
																	E.	7	3	3	1	0	0	
Omitted			2	3		2	3		2	5	5	4			2	3		4	10	12	14	11	26	10.211

Meteorological Journal—Continued.

	Average of Summer Months 1839.											*Total of Summer Months* 1839.														
	Barometer.			Thermometer.					Hygr'm'tr, 2 P.M.			Sky.				Winds.				Clouds.				Rain.	
	7 A.M.	2 P.M.	9 P.M.	7 A.M.	2 P.M.	9 P.M.	Reg'r.	Mean.	Dew point.	Diff. bet. dew pt. & therm.	Wet bulb.		7 A.M Days	2 P.M Days	9 P.M Days		7 A.M Days	2 P.M Days	9 P.M Days	7 A.M Days	2 P.M Days	9 P.M Days	Rain Gauge. Inches.		
Summer, 1839. Average	29.48	29.47	29.48	65.48	76.93	67.80	62.43	69.82	61.85	13.77	67.68					N.	10	6	7	4	3	2			
Maximum	29.78	29.77	29.76	77.50	91.00	79.00	75.25	80.00	77.48	28.24	79.50	Ent. clr	23	3	25	N. W.	27	20	16	17	23	6			
Minimum	29.13	29.17	29.16	50.00	57.25	53.00	49.00	53.125	46.14	0.00	54.00	Ent.cld	21	16	20	N. E.	14	11	15	5	6	0			
Range	.65	.60	.60	27.50	33.75	26.00	26.25	26.875	31.34	28.24	25.50	Prt. clr.	45	68	41	S.	11	10	12	3	4	2			
																S. W.	16	24	19	13	13	7			
																S. E.	5	5	10	4	7	2			
																W.	6	9	6	22	30	8			
																E.	2	3	3	2	0	1			
Omitted		2			2			2	3	3	3		3	5	6		1	3	4	7	7	39	10.373		

	Average of Autumnal Months 1839.											*Total of Autumnal Months* 1839.														
Autumn, 1839. Average	29.59	29.57	29.58	46.51	62.04	51.89	44.60	53.20	47.09	14.27	54.29					N.	10	6	6	3	4	0			
Maximum	30.12	30.13	30.16	76.00	86.00	75.50	74.00	80.00	75.14	28.70	76.50	Ent. clr	37	19	42	N. W.	17	20	22	9	19	4			
Minimum	28.96	28.93	28.92	14.50	25.00	19.00	14.00	19.50	5.38	0.00	21.00	Ent.cld	18	14	22	N. E.	11	13	13	3	2	0			
Range	1.16	1.20	1.14	61.50	61.00	56.50	60.00	60.50	69.76	28.70	55.50	Prt. clr.	35	57	25	S.	5	8	8	1	3	1			
																S. W.	21	20	15	14	14	1			
																S. E.	9	10	12	4	5	0			
																W.	9	8	8	15	22	4			
																E.	8	5	5	1	4	0			
Omitted	1	2	2	2	2	2		2	2	2	2		1	1	2		1	1	2	6	3	39	6.733		

Notices of the weather, and meteorological observations, made at Nashville, Tennessee. By Prof. J. Hamilton.

TO THE COMMITTEE OF THE FRANKLIN INSTITUTE ON METEOROLOGY.

Meteorological Summary, April, 1840.

Mean temperature 62°.63—max. 88° on 25th—min. 35° on 2d day. Range 53°—mean height, 29.597 in., max. 29.86 on 13th—min. 29.32 on 17th. Range 54°. Spring remarkably forward. Apple blossoms seen on the 3d, and roses abundant on the 25th. The minimum temperature during the night of the 25th was only 74°, and the windows of dormitories were generally kept open. On the same day, however, in Rome, a deep snow fell, and we are told of a similar occurrence in 1505. A white frost was seen here on the 13th, and might have been on the 2d but for the clouds. The amount of rain during the month was 11.82 inches. There were 16 days, either wholly or partially rainy. Of 90 observations on direction of winds, 41 were from S. W., 21 from W. and from N. E., E. and S. E. 15, besides 13 under-currents. On the 26th, a thunder storm from 9 h. 15 m. to 10 h., A. M., with South wind, which changed to N. W. by W. at 11¼ A. M. A severe storm this day in Maine.

May.

Mean temperature 66°.7—max. 86° on 31st—min. 42° on 12th. Range 44°. Max. of Bar. 29.82 on 12th—min. 28.98 on 3d. Range 84. This month, too, had 16 days of rain, and the amount that fell was 6.55 inches. On the 7th, 2.30 in., and on the 27th, 2.12 inches. E., S. E. and S. W. wind very prevalent. The 7th day, memorable for the Tornado at Natchez, was ushered in with a thunder storm, at 7, A. M. The thunder and rain were very heavy for about four hours. An intermission then ensued of two hours, when the storm was renewed, but with less violence, and continued until 11, P. M. The wind, during the day, was Easterly, until about 3, P. M., afterward S. E. The Thermometer varied from 64° to 67°, and the Barometer from 29.44 to 29.37. The minimum being at 3, P. M. is the same as given by Dr. Tooley of Natchez, near the time of the Tornado. It continued falling until 3, P. M. on the 8th, when it was at 29.06. Wind S. W. until 5, P. M., and Dew point 58°—the violent storms at this hour, in several places N. E. of Nashville, with hail as large as hens' eggs. No rain here. The 10th, 11th and 12th days cloudy and cold. A thunder storm on the 29th, at 10, P. M., while you had the Aurora Borealis.

June.

Mean temperature 76°.65—max. 94° on 27th—min. 52° on 8th. Range 42°. Mean of Bar. 29.566—max. 29.85 on 11th—min. 29.28 on 3d. Range 57. This also was a wet month, there being 10 days on which it rained. Whole amount of rain 5.72 inches. Of 90 observations at 9, A. M., Noon, and 3, P. M., 52 presented a clear sky—29 cloudy, and 9 rainy. Of a like number on winds, 39 were from the S. W.—21 from the W., and 21 from the N. E., E. and S. E. The second week alone gave fine weather.

During the morning of June 20th, cumuli abound, and at noon a thunder storm is formed in S. and S. W. At 2, P. M. detached clouds approach with vivid flashes of lightning and heavy thunder. At 6, P. M. a heavy storm from S. W. with much lightning and rain, but little thunder. Rain ceased at 11, P. M., but still cloudy and lightning at a distance.

Meteorological Observations, at the Summer Solstice of 1840, ***made in conformity with the instructions of the South African Literary and Philosophical Institution, at the University of Nashville, Tennessee, in North Latitude,*** 36° 09′ 33″, ***West Long.*** 86° 49′ 03″; ***by*** JAMES HAMILTON, ***Prof. Math. and N. Philos.***

June 22, 1840.

	External Therm.	Attach'd Therm.	Barom.				
6 A. M.	73	83	29.49	c	$\frac{S.\ W.}{N.\ E.}$	0 1	same cumuli in North. 6 h. 20 m. gentle rain, 6 h. 30 m. thunder
7	73.5	82	29.52	R	*S. W.*	0	Storm heavy in S. and S. West. Rain heavy at 7 h. and continued so.
8	73.5	81.5	29.53	r	$\frac{S.\ W.}{S.\ E.}$	0	45 minutes then lighter until 8 h. 30 m.
9	77	82	29.55	c	*S. W.*	0	Still sprinkles.
10	78.5	82	29.56	r	$\frac{S.\ W.}{S.\ E.}$	0 1	Rain increases.
11	78.5	82	29.56	R	$\frac{S.\ W.}{S.}$	0 1	Heavy rain—11 h. 30 m. lighter.
12	79	81.5	29.54	c	$\frac{S.\ W.}{S.\ E.}$	0 0	Ceases 11 h. 35 m.—clouds break in N. W. and W. Rain gauge 1.31 inches.
1 P. M.	81	81.5	29.535	c	$\frac{S.\ W.}{S.\ E.}$	0 1	
2	83.5	81.5	29.53	c	$\frac{S.\ W.}{S.\ E.}$	1 1	Clouds gather in S. W.
3	81	81.5	29.527	c	$\frac{S.\ W.}{S.\ E.}$	1 1	Dew point 69°—3 h. 15 m. shower in S.
4	82	82	29.53	c	$\frac{S.\ W.}{S.}$	1 1	3 h. 30 m. clouds thin in N. and strong S. W. wind.
5	80	82	29.54	c	*S. W.*	0	5 h. 25 m. cumuli in S.—sun shines fair.
6	79.5	81.5	29.54	$\frac{C}{2}$	*S. W. by W.*	1	A clear sky in West.
7	78	81.5	29.55	c	Do.	1	Sun sets clear.
8	77	81.5	29.57	$\frac{3}{4}$ c	Do.	1	Broken clouds over North—bluish hue.
9	75	81	29.585	$\frac{C}{2}$	Do.	2	Thunder storm in N.—thunder audible.
10	76	81	29.60.	$\frac{C}{2}$	*S. W.*	1	Black clouds in horizon, W. and S. W. These clouds more elevated.
11	74	81	29.62	c	*S. W.*	0	same spread over the sky, 11h. 15 m. little rain.
12	75	80.5	29.61	c	*S. W.*	0	Clouds thinner. Light from rising moon. Dew point 69.5—12 h. 50 m. moon shines.
			JUNE 23.				
1 A. M.	75.5	80.5	29.60	c	*S. W.*	1	Clouds break in North.
2	74	80.5	29.60	c	*S. W.*	1	Sprinkles a little.
3	76	80	29.60	c	*S. W.*	0	Clouds heavy in N. W. moon visible.
4	75.5	79.8	29.62	c	$\frac{S.\ W.}{W.}$	0	
5	74.5	79.5	29.63	c	$\frac{W.}{E.}$	0	5 h. 35 m. a very light rain which continues till 6 h. 20 m.
6	76	79.5	29.675	r	$\frac{S.\ W.}{S.\ E.}$	1	
7	77.5	79.5	29.68	r	*S. W.*	1	6 h. 50 m. heavy clouds in S.
8	76.5	79.5	29.69	r	*S. W.*	1	Showers from 7 h. to 7 h. 30 m. Dew point 72.
9	79	80	29.70	r	*S. W.*	1	Between 9 h. and 10 h. rain heavy.

10	82	80.5	29.70	c	*S. W.* 1	10 h. 20 m. rain increases.
11	82.5	82	29.69	r	*S. W.* 2	Wind continued S. W. until June 28th, P. M.
12	79.5	79	29 69	r	*S. W.* 1	with occasional showers, making 4.24

inches of rain in all—weather settled with W. wind—min. of Bar. during these rains. 29.44 on 26th. Dew point at 3, P. M., June 23, 69.5—24th, 73—25th, 73—26th, 75—27th, 74—28th, 70, and 29th, 70.—The above observations were made in the same place and with the same instruments as in former cases.

Franklin Institute.

Quarterly Meeting.

The Sixty-sixth Quarterly Meeting of the Institute was held at their Hall, July 16, 1840.

Robert M. Patterson, M. D. was appointed Chairman, and

John H. Towne, Esq. Recording Secretary, P. T.

The minutes of the last meeting were read and approved.

Donations to the Institute were presented from the following gentlemen:

Of Books and Engravings—from The Royal Geographical Society; The Society of Arts; and William Vaughan, Esq., London; Hon. Daniel Sturgis, Washington city, D. C.; Dr. D. Haughton, Detroit, Michigan; W. L. Atlee, M. D., Lancaster, Pennsylvania; Col. S. H. Long, Marietta, Georgia; Prof. G. Troost, Tennessee; George Merrick, Esq., New Orleans, Louisiana; Wm. Jenks, Esq., Springfield, Mass.; and Messrs. Thomas M. Way; B. M. Hinchman; Joseph S. Silver; J. J. Barclay; G. Emerson, M. D.; James Ronaldson; Isaac Hays, M. D.; C. Ellett, Jr.; J. C. Montgomery; Sol. W. Roberts; John C. Cresson; Andrew Young; Edward Miller; L. Vanuxum; A. L. Elwyn, M. D.; Frederick Fraley; Richard Penn Smith; W. H. Wilson; Reubens Peale; William Strickland; Thomas U. Walter; R. C. Taylor; Alexander Dallas Bache, and Robert Jones, of Philadelphia.

Of Models—from Edward Bancroft, of Providence, R. Island; William Russell, of the city of New York; William Jenks, of Springfield, Massachusetts, and L. E. Denison, of Sayville, Connecticut.

Of Minerals—from Mr. Joseph Harrison, Jr., Philadelphia.

Of Galvanic Medels—from Messrs. Isaiah Lukens, Joseph Saxton, and Charles Sheble, of Philadelphia.

The Actuary laid on the table the periodicals received in exchange for the Journal of the Institute since the last meeting.

The quarterly report from the Board of Managers was read and accepted and referred for publication.

The Treasurer submitted his quarterly statement of the Funds of the Institute, which was received and accepted.

George W. Smith, Esq. called the attention of the Institute to that part of the report from the Board of Managers, relative to the loss sustained by the Institute in the decease of William H. Keating, Esq., and after some remarks, moved that a committee be appointed to prepare a biographical notice of the deceased, which was seconded by Prof. John C. Cresson.

Whereupon, Messrs. Samuel V. Merrick, John C. Cresson, Alexander Dallas Bache, and Robert M. Patterson, were appointed the committee.

Robert M. Patterson, *Chairman.*

John H. Towne, *Rec. Sec. Pro. Tem.*

Sixty-sixth Quarterly Report of the Board of Managers.

The Board of Managers respectfully submit to the Society their sixty-sixth quarterly report.

The three months, just elapsed, embrace the period of the year in which the more active operations of the Institute are in great measure suspended, and which does not, therefore, afford materials for a very extended or interesting report. The Committee on Science and the Arts, and the monthly conversation meetings, which constitute the most prominent objects of interest this season, have been sustained with unabated activity, and afford abundant evidence of the good policy of their establishment and continued support. The latter will be suspended, according to the custom of former years, for the months of July and August, and will be resumed in the month of September, it is hoped, with renewed interest and unceasing benefit.

The Committee on Instruction anticipate the ability to extend their important department, by the addition of two complete courses of volunteer lectures; one on Geology, and the other on Architecture and the Fine Arts. These, with the regular courses on Chemistry, Natural Philosophy, and Technology, will occupy five evenings in the week, and it is expected that the remaining evening will be occasionally filled by lectures on various interesting subjects. The Committee on Premiums and Exhibitions have completed their preliminary arrangements for the exhibition of American Manufactures to be held this year, opening on the sixth day and continuing to the seventeenth day of October. The address of the Committee has been prepared for distribution, and is recommended to the notice of members and to their active exertions for giving it extensive circulation.

The Journal of the Institute, and its Cabinets of Models, of Minerals and of the Arts, receive the usual attention of the Committees to whose care they are intrusted, and are gradually acquiring greater value and usefulness.

The Board has received, with feelings of deep sorrow, intelligence of the decease of their late fellow member, William H. Keating, who died in London on the 17th day of May, ulto.—Mr. Keating was one of the original projectors of the Institute; he has served as one of its managers from its foundation to the period of his lamented decease, and has ever proved to be the zealous friend and efficient promoter of all its useful objects. To the members of the Institute with whom he has been so long associated, his memory is endeared by the recollection of his inflexible rectitude of moral and religious principle; tempered in his intercourse with his fellow men, by a suavity of manner resulting from the genuine benevolence of his heart. It is much to be desired that the benign influence of his example may be perpetuated to the Institute by a permanent record of his services and character.

During the past quarter, Messrs. Isaac S. Ashton, H. I. Biddle, and W. J. Birkey, have become life members.

The Treasurer's report on the funds of the Institute is herewith submitted.

JOHN C. CRESSON, *Chairman.*

WILLIAM HAMILTON, Actuary.

Minutes of Meeting of the Board of Managers.

A special meeting of the Board of Managers was held at the Hall of the Institute, June 27, 1840.

Professor JOHN C. CRESSON, *Chairman.*

The Chairman stated that the meeting had been convened to adopt such measures as might be deemed proper, in consequence of the death of one of the members of the Board.

Dr. Hays announced with some brief remarks, that the Board had just sustained a severe loss in the death of William H. Keating, Esq., who died in London on the 17th day of May, ulto.

Professor Alexander Dallas Bache then offered the following resolutions, which were seconded by Dr. Hays, and unanimously adopted, viz:

Resolved, That the Board of Managers of the Franklin Institute of the State of Pennsylvania, for the promotion of the Mechanic Arts, have learned with the deepest regret, the decease of their late fellow member, William H. Keating, Esq., whose zeal and activity during a period of service, beginning with the establishment of the Board, commanded their respect, while his amiability and consideration for others, endeared him to them in an especial manner.

Resolved, That as one of the founders of the Franklin Institute, its first Professor of Chemistry applied to the arts, and as a most efficient member of its Board of Managers and Committees from the first organization of the Institute, with only a brief interval, during his absence from the country, until the period of his lamented decease, Mr. Keating is justly entitled to the grateful thanks of those upon whom the benefits of the institution have been conferred.

Resolved, That the Chairman of the Board of Managers, be requested to communicate the decease of W. H. Keating, Esq. to the Franklin Institute, in a manner expressive of the high regard entertained for his services by his fellow members of the Board, and their deep feeling for his loss.

Resolved, That a committee be appointed to offer, on behalf of the Board of Managers of the Franklin Institute, to the family of Mr. Keating, sincere condolence in their affliction, and to express the sense of the loss which has been sustained, not only by his friends, but by the community in which Mr. Keating resided, and to communicate to them the foregoing resolutions.

On motion, Isaac Hays, M. D., Alexander Dallas Bache, Samuel V. Merrick, John Struthers, and Frederick Fraley, were appointed a committee to present the above resolutions to the family of Mr. Keating.

JOHN C. CRESSON, Chairman.

WILLIAM HAMILTON, Actuary.

Conversation Meeting.

The 10th conversation meeting held at the Hall of the Institute on Thursday evening, June 27th, was numerously attended and highly interesting.

Professor James C. Booth briefly explained the process of manufacturing and painting porcelain; and called attention to the importance of this much neglected branch of the arts.

Dr. Hare, after succinctly describing the progressive improvements in voltaic or galvanic batteries, explained a very powerful apparatus (which

was exhibited,) made upon his improved plan, and by his directions, for Professor Silliman. Mr. Joaquim Bishop, Dr. Hare's former assistant, was the manufacturer.

Among other interesting articles we noticed some specimens of cast and wrought iron made with anthracite coal. The cast iron from the Roaring Creek Furnace, and the bar iron from the Catawissa Forge: some leaden pipe, remarkable for the beautiful polish of its surface and its superior quality; it was made by a new process at the establishment of Messrs. Tatham & Brothers.

Mr. John A. Stewart exhibited a model of a house heated upon a novel plan; and Mr. Scott, a refrigerator, apparently well adapted to the purpose for which it was designed.

COMMITTEE ON SCIENCE AND THE ARTS.

Report on a Plan for constructing Railroads, invented by Mr. James Herron, of Maryland, Civil Engineer.

The Committee on Science and the Arts, constituted by the Franklin Institute of the State of Pennsylvania, for the promotion of the Mechanic Arts, to whom was referred for examination a Plan for constructing Railroads, invented by Mr. James Herron, of Maryland, REPORT:—

That they have examined with much care and interest the drawings and model submitted by the inventor, and have had the advantage of this gentleman's personal explanations.

It appears to us, that Mr. Herron has fully understood and appreciated the evils inseparably connected with those plans of railway superstructure, so much in use here, as well as in Europe, in which the rails are supported upon isolated blocks of stone, or sleepers of timber. In a climate like that of our northern and middle states, it is out of the question for us to encounter the expenditure which would be necessary in order to obviate the influence of frost. Even our best constructed roads are upheaved by its power, and where the supports of the rails are in the least degree unequal in their character, either in consequence of different dimensions, different depths of foundation, or different capacities in the sub-soil for imbibing water, the result is a succession of irregular elevations, depressions and lateral displacements, which are destructive alike to rails, cars and engines, and productive of a jarring and lurching motion extremely disagreeable to passengers, and by no means free from danger. When the rails are supported on cross ties of timber resting upon mud-sills of plank, (which is also a common form of superstructure in America,) a much better form of road is obtained, though still far from perfect. The irregularities caused by unequal settlements are less numerous and less sudden, but there is still nothing to prevent one mud-sill from rising above another from the action of frost, where the ends of two come in contact. The sleepers may be, and no doubt are, often elevated entirely from the sills, and are also laterally displaced, giving a slightly serpentine form to the rails, which enhances the flanch friction materially. But even if all these evils be avoided, there is still a radical defect common both to this and the former plan, which is thus adverted to in a pamphlet written on this subject by John Reynolds, Esq. in 1837.—"The chief obstacle to durability which pertains to the plan of supports at intervals, whether they be blocks or sleepers, is the alternation of *flexible spaces* and *rigid points*, which (even if the supports

maintain an exact level,) produces in carriages moving rapidly over them, a series of concussions, as the wheels successively impinge on the rigid or supported parts of the rails. Also, however small may be the deflexion of the rail between its points of support, those points become fulcra, on which it acts as a lever, to raise or shake the supports next beyond them. When the supports have assumed irregular heights, (which is the usual case) not only are the above evils greatly aggravated, but the rail acts on every depressed support as a spring-beam, tending to jerk it up, or loosen its fastenings."

In addition to the above, we may add, what is perhaps sufficiently obvious, viz. that the weight of the iron rails may be diminished proportionably with the distance between the points of support; and consequently, the minimum quantity of iron will be required, when the bearings are continuous.

The difficulties above alluded to are not merely theoretical. Every engineer who has had charge of the repairs of a finished railroad will vouch for their practical existence, although much discrepancy of opinion exists concerning the most appropriate remedies.

Mr. Herron's object appears to have been, to devise a plan in which all the parts forming the structure shall be fully and adequately supported; while at the same time they shall be so connected together, that no portion will be liable to independent displacement, either laterally or vertically.—He has proposed several modifications, all of which he thinks may be applicable in particular situations. Those which the committee consider decidedly preferable, both from simplicity and efficiency, are designated on his drawings, as Nos. 1 and 4. In both of these, he uses a continuous line of timbers supporting each rail throughout, which are joined at the points of contact by a new scarph, peculiarly well adapted to the purpose, and strengthened materially by the manner in which the iron rails (which may be either ⌶ or bridge form,) are attached to the longitudinal timbers. The whole is supported and stiffened by a system of diagonal cross planks, which have a triple use, as they afford a considerable breadth of bearing, act both as ties and braces to prevent lateral displacement, and being loaded by ballast will counteract any tendency which the bearers might otherwise have to become warped by changes of moisture and temperature. Sand or gravel is to be rammed under the longitudinal timbers, so as to give them a firm and equable foundation throughout, and the whole roadway when finished, is to be filled with the same materials, as high as the base of the iron rails.

The wrought iron chairs proposed by Mr. Herron for the joints of the rails, are of a form new to this Committee, and if they can be manufactured by machinery, (which, if good iron be used, appears probable,) will possess advantages over most of those now employed, as they will clasp the rails, without the intervention of wedges or screw-bolts, with sufficient firmness to prevent any deviation at the joints, yet not so closely as to hinder them from expanding longitudinally by changes in temperature. The rails are to be fastened permanently at their centres to the longitudinal timbers, so as to cause the expansion to take place equally in both directions, thus reducing the spaces necessary between the ends of the rails to a minimum.

The Committee do not think it necessary to enter into a minute description of the proposed plans, which could not be made fully intelligible without accurate drawings; nor do they wish to be understood as fully approving of all the parts, some of which appear to be attended with practical difficul-

ties, though not of an insurmountable character. The principles aimed at in the design, have their fullest sanction; and they would gladly witness an experiment carried out upon a working scale, with timber kyanised, or otherwise prepared so as to be secure from decay.

Of course there are many points of importance embodied in the general scheme, which have been previously suggested by other engineers, who have at various times adopted similar contrivances. Other details are certainly original, and the whole combination evinces a degree of judgment and ingenuity which we hope will not pass unrewarded.

By order of the Committee.

WILLIAM HAMILTON, Actuary.

July 9, 1840.

Report on the Boring Mill, constructed by Messrs. Merrick & Towne.

The Committee on Science and the Arts, constituted by the Franklin Institute of the State of Pennsylvania, for the promotion of the Mechanic Arts, to whom was referred for examination the Boring Mill constructed by Messrs. Merrick & Towne, of Southwark, Philadelphia, Penn., REPORT:—

That the visit to the establishment of Messrs. Merrick & Towne, known as Southwark Foundry, for the purpose of examining their Boring Mill, afforded an opportunity to learn many interesting particulars, with a brief statement of which it may be useful to preface their description of the machine under consideration. Southwark Foundry is situated on the Prime Street Railroad, between Fourth and Fifth streets. The buildings occupy three sides of a plot 200 by 370 feet, and consist of a machine shop 160 by 40 feet, three stories high; a smith shop of the same ground area, one story high; a Foundry 180 by 50 feet, and a boiler-shop 145 by 45 feet. The ground floor of the machine shop, with the exception of a portion at the front end, used as an office, is occupied by the Boring and Planing machines and heavy slide Lathes, one of which will turn a piece of work 4 feet diameter and 31 feet long. Upon the second floor are the lighter lathes, vice-benches, drilling machines, and small planing machine. In this room, at the time of the visit of the Committee, were to be seen various specimens of finished work, which fully sustain the good reputation of Philadelphia in this branch of manufacture. The third floor is used as the pattern-makers' shop and pattern loft. Some of the patterns in course of construction for the frame of the engine of the New Jersey Frigate hereafter referred to, would seem from their immense size to be designed to form a large and highly ornamented building rather than parts of a movable machine. At the southern end of the machine shop is a steam engine of 15 H. P., which drives the machinery of this building and the adjoining smithshop. The latter contains 18 forges, the blast for which is derived from a fan driven by the engine. The heavier forgings are executed under a small vertical trip-hammer, which is capable of faggoting a bar 6 inches square. This must prove of great advantage both as a labour-saving machine and as a means of obtaining greater perfection of the weldings. Some samples of forgings were shewn which evince a high degree of skill in this important art.

In the Foundry much was seen worthy of approval. The machinery and apparatus do not appear to be more extensive or various than are seen in many other establishments, but the magnitude of the castings is much

superior, and their perfect finish and soundness fully equal to any which have come under notice of the Committee. The permanent apparatus comprises three 8 ton cranes, two ovens for drying moulds, one 8 by 24 feet, the other 12 by 32, and two cupola furnaces, respectively 39 and 42 inches diameter, with a fan blast driven by an 8 horse engine. These cupolas are capable of melting iron for a casting of 16 tons. The heaviest piece of casting which has yet been made is a bed-plate for the U. S. Frigate's engines which these gentlemen are constructing. For this casting, which weighs about 14 tons, 36,000 lbs. of metal were melted in 2 hours and 40 minutes; the metal being drawn off into shanks as fast as it came down.

The plate has just been cleared from the mould, and displays in its broad proportions, a most beautiful specimen of casting, presenting a surface of more than 200 square feet without blemish.

The steam cylinders for the same engines, weighing 8 tons net each, were melted by the larger cupola above, in about the same time. The most rapid melting in this cupola was 9000 lbs. in one hour.

The boiler shop is enlivened with the din of hammers employed in making the boilers for the Frigate's engines, four in number, made of copper 14 feet 6 inches long, 14 feet wide, and 12 feet high, with double return flues, weighing, when finished, 200,000 lbs.

The engines for the U. S. Frigate, to which allusion has been made, are now in a state of considerable forwardness, and constitute an object of much interest to any one desiring the success of American manufactures. They are of the general form known as English Marine Engines—the cylinders being vertical, with two lever beams, one on each side, working on pedestals rising from the bed-plate, and connected with the cross-head over the cylinder and with the connecting rod, by side links.

The principal dimensions are, diameter of cylinders 75 inches, length of stroke 7 feet, bed-plate 29 feet 2 inches, by 7 feet 4 inches, with channels cast on—Main shaft, wrought iron, 17 inches diameter, 25 feet 8 inches long—Paddle wheels entirely of iron, 29 feet 8 inches diameter and 10 feet bucket. The work upon them was commenced in January, 1840, and is expected to be completed in the spring of 1841.

The large Boring Mill which was the special object of the visit to Southwark Foundry, appears to be of entirely novel construction, and especially adapted to work of great magnitude, such as is found in the large engines now building. The boring shaft is vertical, and the cylinder to be bored stands upright on the bed or face-plate, and revolves around the bar—the latter being stationary. The face-plate is keyed on to the upper end of a vertical shaft 8 feet long, stepped into a brass bearing, and confined by a collar directly beneath the plate; the collar being secured by heavy timber-framing, bolted to a massive brick foundation. A pinion geared to the main shaft of the steam engine gives motion to the face-plate by working into teeth on its periphery. The boring-bar is 14 inches in diameter; it is inserted into a recess in the centre of the face-plate, and secured at the upper end by a cast iron plate on the second floor of the building. Directly over this on the third floor, is a hoisting machine for raising the bar and placing work on the mill.

The boring-head, on which the cutters are fixed, is keyed to a movable sleeve which traverses up and down the boring-bar upon two feathers, working in grooves on its opposite sides. The traversing motion on the sleeve and head is derived from a long screw which passes freely down the hollow axis of the boring-bar: and the head of the screw is a cross-head, con-

nected by two stirrups to the sleeve. The nut of the screw swivels on the head of the boring-bar, and receives motion from a train of gearing and tangent screw: the rate of traverse motion is varied by changing the gearing of the nut.

The cylinder to be bored is screwed at the lower end to the face-plate, and at the upper end to a cast iron cross which works around a collet, fitted to the boring-bar, with slots for the passage of the stirrups which sustain the boring head: this collet is movable up and down the bar to suit the length of the cylinder.

By this arrangement the cylinder is firmly fixed at both ends to the bar which carries the cutters, and cannot possibly get out of centre, nor be subject to any inaccuracy except what may arise from the springing of the boring-bar between the bearings at the ends of the cylinder, which is not likely to be an appreciable quantity in a cast iron bar 14 inches diameter. By substituting a cast iron rest in place of the boring-bar, for which provision is made, the mill is converted into a horizontal face-plate lathe, capable of turning a flanch 11½ feet in diameter. It will bore a cylinder of 96 inches diameter and 14 feet length. The work appears to be executed with much greater rapidity than is usual upon the horizontal mill—the cylinders for the Frigate, one of which was in the mill at the time of examination, having been completed in eight days each.

This machine must be esteemed of great importance in the construction of large machinery, both as a means of expediting the work and of insuring greater accuracy of finish. It has the advantage in common with other vertical boring mills, of avoiding the imperfection of form arising from boring a large cylinder while lying on its side, such a cylinder being oval in its section when taken out of the mill and placed upright.

Possessing therefore, as it does in the opinion of the Committee, both the requisites of novelty and usefulness, it is deemed a proper subject for the Scott's Legacy premium, an award of which is accordingly recommended.

By order of the Committee.

WILLIAM HAMILTON, Actuary.

July 17, 1840.

Mechanics' Register.

An Act in addition to the act to promote the progress of Science and Useful Arts.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That any person who may be in possession of, or in any way interested in, any patent for an invention, discovery, or improvement, issued prior to the fifteenth day of December, in the year of our Lord one thousand eight hundred and thirty-six, or in an assignment of any patent, or interest therein, executed and recorded prior to the said fifteenth day of December, may without charge, on presentation or transmission thereof to the Commissioner of Patents, have the same recorded anew in the Patent Office, together with the descriptions, specifications of claim, and drawings annexed or belonging to the same; and it shall be the duty of the Commissioner to cause the same, or any authenticated

copy of the original record, specification, or drawing which he may obtain, to be transcribed and copied into books of record to be kept for that purpose; and wherever a drawing was not originally annexed to the patent and referred to in the specification, any drawing produced as a delineation of the invention, being verified by oath in such manner as the Commissioner shall require, may be transmitted and placed on file, or copied as aforesaid, together with the certificate of the oath; or such drawings may be made in the office, under the direction of the Commissioner, in conformity with the specification. And it shall be the duty of the Commissioner to take such measures as may be advised and determined by the Board of Commissioners provided for in the fourth section of this act, to obtain the patents, specifications, and copies aforesaid, for the purpose of being so transcribed and recorded. And it shall be the duty of each of the several clerks of the judicial courts of the United States, to transmit as soon as may be, to the Commissioner of the Patent Office, a statement of all the authenticated copies of patents, descriptions, specifiations, and drawings of inventions and discoveries made and executed prior to the aforesaid fifteenth day of December, which may be found on the files of his office; and also to make out and transmit to said Commissioner, for record as aforesaid, a certified copy of every such patent, description, specifiation, or drawing, which shall be specially required by said Commissioner.

SECTION 2. *And be it further enacted*, That copies of such record and drawings, certified by the commissioner, or, in his absence, by the chief clerk, shall be prima facie evidence of the particulars of the invention and of the patent granted therefor, in any judicial court of the United States, in all cases where copies of the original record or specification and drawings would be evidence, without proof of the loss of such originals; and no patent issued prior to the aforesaid fifteenth day of December shall, after the first day of June next, be received in evidence in any of the said courts in behalf of the patentee or other person who shall be in possession of the same, unless it shall have been so recorded anew, and a drawing of the invention, if separate from the patent, verified as aforesaid, deposited in the Patent Office; nor shall any written assignment of any such patent, executed and recorded prior to the said fifteenth day of December, be received in evidence in any of the said courts in behalf of the assignee or other person in possession thereof, until it shall have been so recorded anew.

SECTION 3. *And be it further enacted*, That whenever it shall appear to the Commissioner that any patent was destroyed by the burning of the Patent Office building on the aforesaid fifteenth day of December, or was otherwise lost prior thereto, it shall be his duty, on application therefor by the patentee or other person interested therein, to issue a new patent for the same invention or discovery, bearing the date of the original patent, with his certificate thereon, that it was made and issued pursuant to the provisions of the third section of this act, and shall enter the same of record: *Provided, however*, That before such patent shall be issued, the applicant therefor shall deposit in the Patent Office a duplicate, as near as may be, of the original model, drawings, and descriptions, with specification of the invention or discovery, verified by oath, as shall be required by the Commissioner; and such patent and copies of such drawings and descriptions, duly certified, shall be admissible as evidence in any judicial court of the United States, and shall protect the rights of the patentee, his administrators, heirs, and assigns, to the extent only in which they would have been protected by the original patent and specification.

SECTION 4. *And be it further enacted,* That it shall be the duty of the Commissioner to procure a duplicate of such of the models destroyed by fire on the aforesaid fifteenth day of December, as were most valuable and interesting, and whose preservation would be important to the public; and such as would be necessary to facilitate the just discharge of the duties imposed by law on the Commissioner in issuing patents, and to protect the rights of the public and patentees in patented inventions and improvements: *Provided,* That a duplicate of such models may be obtained at a reasonable expense: *And provided, also,* That the whole amount of expenditure for this purpose shall not exceed the sum of one hundred thousand dollars. And there shall be a temporary board of commissioners, to be composed of the Commissioner of the Patent Office and two other persons to be appointed by the President, whose duty it shall be to consider and determine upon the best and most judicious mode of obtaining models of suitable construction; and, also, to consider and determine what models may be procured in pursuance of, and in accordance with, the provisions and limitations in this section contained. And said commissioners may make and establish all such regulations, terms, and conditions, not inconsistent with law, as in their opinion may be proper and necessary to carry the provisions of this section into effect, according to its true intent.

SECTION 5. *And be it further enacted,* That, whenever a patent shall be returned for correction and re-issue, under the thirteenth section of the act to which this is additional, and the patentee shall desire several patents to be issued for distinct and separate parts of the thing patented, he shall first pay, in manner and in addition to the sum provided by that act, the sum of thirty dollars for each additional patent to be issued: *Provided, however,* That no patent made prior to the aforesaid fifteenth day of December, shall be corrected and re-issued until a duplicate of the model and drawing of the thing, as originally invented, verified by oath as shall be required by the Commissioner, shall be deposited in the Patent Office. Nor shall any addition of an improvement be made to any patent heretofore granted, nor any new patent be issued for an improvement made in any machine, manufacture, or process, to the original inventor, assignee, or possessor, of a patent therefor, nor any disclaimer be admitted to record, until a duplicate model and drawing of the thing originally invented, verified as aforesaid, shall have been deposited in the Patent Office, if the commissioner shall require the same; nor shall any patent be granted for an invention, improvement, or discovery, the model or drawing of which shall have been lost, until another model and drawing, if required by the Commissioner, shall, in like manner, be deposited in the Patent Office. And in all such cases, as well as in those which may arise under the third section of this act, the question of compensation for such models and drawings, shall be subject to the judgment and decision of the commissioners provided for in the fourth section, under the same limitations and restrictions as are therein prescribed.

SECTION 6. *And be it further enacted,* That any patent hereafter to be issued, may be made and issued to the assignee or assignees of the inventor or discoverer, the assignment thereof being first entered of record, and the application therefor being duly made, and the specification duly sworn to by the inventor. And in all cases hereafter, the applicant for a patent shall be held to furnish duplicate drawings, whenever the case admits of drawings, one of which to be deposited in the office, and the other to be annexed to the patent, and considered a part of the specification.

SECTION 7. *And be it further enacted*, That whenever any patentee shall have, through inadvertence, accident, or mistake, made his specification of claim too broad, claiming more than that of which he was the original or first inventor, some material and substantial part of the thing patented being truly and justly his own, any such patentee, his administrators, executors, and assigns, whether of the whole or of a sectional interest therein, may make disclaimer of such parts of the thing patented as the disclaimant shall not claim to hold by virtue of the patent or assignment, stating therein the extent of his interest in such patent; which disclaimer shall be in writing, attested by one or more witnesses, and recorded in the Patent Office, on payment by the person disclaiming, in manner as other patent duties are required by law to be paid, of the sum of ten dollars. And such disclaimer shall thereafter be taken and considered as part of the original specification, to the extent of the interest which shall be possessed in the patent or right secured thereby, by the disclaimant, and by those claiming by or under him subsequent to the record thereof. But no such disclaimer shall affect any action pending at the time of its being filed, except so far as may relate to the question of unreasonable neglect or delay in filing the same.

SECTION 8. *And be it further enacted*, That whenever application shall be made to the Commissioner for any addition of a newly discovered improvement, to be made to an existing patent, or whenever a patent shall be returned for correction and re-issue, the specification of claim annexed to every such patent shall be subject to revision and restriction, in the same manner as are original applications for patents; the Commissioner shall not add any such improvement to the patent in the one case, nor grant the reissue in the other case, until the applicant shall have entered a disclaimer, or altered his specification of claim in accordance with the decision of the Commissioner; and in all such cases, the applicant, if dissatisfied with such decision, shall have the same remedy, and be entitled to the benefit of the same privileges and proceedings, as are provided by law in the case of original applications for patents.

SECTION 9. *And be it further enacted*, (any thing in the fifteenth section of the act to which this is additional to the contrary notwithstanding.) That whenever, by mistake, accident, or inadvertence, and without any wilful default or intent to defraud or mislead the public, any patentee shall have in his specification claimed to be the original and first inventor or discoverer of any material or substantial part of the thing patented, of which he was not the first and original inventor, and shall have no legal or just right to claim the same, in every such case the patent shall be deemed good and valid for so much of the invention or discovery as shall be truly and bona fide his own: *Provided*, It shall be a material and substantial part of the thing patented, and be definitely distinguishable from the other parts so claimed without right as aforesaid. And every such patentee, his executors, administrators, and assigns, whether of a whole or sectional interest therein, shall be entitled to maintain a suit at law or in equity on such patent for any infringement of such part of the invention or discovery as shall be bona fide his own as aforesaid, notwithstanding the specification may embrace more than he shall have any legal right to claim. But in every such case in which a judgment or verdict shall be rendered for the plaintiff, he shall not be entitled to recover costs against the defendant, unless he shall have entered at the Patent Office, prior to the commencement of the suit, a disclaimer of all that part of the thing patented which was so claimed without right:

Provided, however, That no person bringing any such suit shall be entitled to the benefits of the provisions contained in this section, who shall have unreasonably neglected or delayed to enter at the Patent Office a disclaimer as aforesaid.

SECTION 10. *And be it further enacted,* That the Commissioner is hereby authorized and empowered to appoint agents in not exceeding twenty of the principal cities or towns in the United States, as may best accommodate the different sections of the country, for the purpose of receiving and forwarding to the Patent Office all such models, specimens of ingredients and manufactures, as shall be intended to be patented or deposited therein, the transportation of the same to be chargeable to the patent fund.

SECTION 11. *And be it further enacted,* That instead of one examining clerk, as provided by the second section of the act to which this is additional, there shall be appointed in manner therein provided, two examining clerks, each to receive an annual salary of fifteen hundred dollars; and, also, an additional copying clerk, at an annual salary of eight hundred dollars. And the Commissioner is also authorized to employ, from time to time, as many temporary clerks as may be necessary to execute the copying and draughting required by the first section of this act, and to examine and compare the records with the originals, who shall receive not exceeding seven cents for every page of one hundred words, and for drawings and comparison of records with originals, such reasonable compensation as shall be agreed upon or prescribed by the Commissioner.

SECTION 12. *And be it further enacted.* That whenever the application of any foreigner for a patent shall be rejected and withdrawn for want of novelty in the invention, pursuant to the seventh section of the act to which this is additional, the certificate thereof of the Commissioner shall be a sufficient warrant to the Treasurer to pay back to such applicant two-thirds of the duty he shall have paid into the Treasury on account of such application.

SECTION 13. *And be it further enacted,* That in all cases in which an oath is required by this act, or by the act to which this is additional, if the person of whom it is required shall be conscientiously scrupulous of taking an oath, affirmation may be substituted therefor.

SECTION 14. *And be it further enacted,* That all moneys paid into the Treasury of the United States for patents and for fees for copies furnished by the Superintendent of the Patent Office prior to the passage of the act to which this is additional, shall be carried to the credit of the patent fund created by said act; and the moneys constituting said fund shall be, and the same are hereby, appropriated for the payment of the salaries of the officers and clerks provided by said act; and all other expenses of the Patent Office, including all the expenditures provided for by this act; and, also, for such other purposes as are or may be hereafter specially provided for by law. And the Commissioner is hereby authorized to draw upon said fund, from time to time, for such sums as shall be necessary to carry into effect the provisions of this act, governed, however, by the several limitations herein contained. And it shall be his duty to lay before Congress, in the month of January, annually, a detailed statement of the expenditures and payments by him made from said fund. And it shall also be his duty to lay before Congress, in the month of January, annually, a list of all patents which shall have been granted during the preceding year, designating, under proper heads, the subjects of such patents, and furnishing an al-

phabetical list of the patentees, with their places of residence; and he shall also furnish a list of all patents which shall have become public property during the same period; together with such other information of the state and condition of the Patent Office as may be useful to Congress or to the public.

Approved, March 3d, 1837.

A Bill in addition to "An act to promote the progress of the Useful Arts."

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That there shall be appointed, in manner provided in the second section of the act to which this is additional, two assistant examiners, each to receive an annual salary of twelve hundred and fifty dollars.

Section 2. *And be it further enacted*, That the Commissioner be authorized to employ temporary clerks to do any necessary transcribing, whenever the current business of the office requires it: *Provided, however*, That, instead of salary, a compensation shall be allowed, at a rate not greater than is charged for copies now furnished by the office.

Section 3. *And be it further enacted*, That the Commissioner is hereby authorized to publish a classified and alphabetical list of all patents granted by the Patent Office previous to said publication, and retain one hundred copies for the Patent Office, and nine hundred copies be deposited in the library of Congress, for such distribution as may be hereafter directed; and that one thousand dollars, if necessary, be appropriated, out of the patent fund, to defray the expense of the same.

Section 4. *And be it further enacted*, That the sum of three thousand six hundred and fifty-nine dollars and twenty-two cents be, and is hereby appropriated from the patent fund, to pay for the use and occupation of rooms in the City Hall by the Patent Office.

Section 5. *And be it further enacted*, That the sum of one thousand dollars be appropriated from the patent fund, to be expended under the direction of the Commissioner, for the purchase of necessary books for the library of the Patent Office.

Section 6. *And be it further enacted*, That no person shall be debarred from receiving a patent for any invention or discovery, as provided in the act approved on the fourth day of July, one thousand eight hundred and thirty-six, to which this is additional, by reason of the same having been patented in a foreign country more than six months prior to his application: *Provided*, that the same shall not have been introduced into public and common use, in the United States prior to the application for such patent: *And provided, also*, that in all cases every such patent shall be limited to the term of fourteen years from the date or publication of such foreign letters patent.

Section 7. *And be it further enacted*, That every person or corporation who has, or shall have, purchased or constructed any newly invented machine, manufacture, or composition of matter, prior to the application by the inventor or discoverer for a patent, shall be held to possess the right to use, and vend to others to be used, the specific machine, manufacture, or composition of matter so made or purchased, without liability therefor to the inventor, or any other person interested in such invention; and no patent shall be held to be invalid by reason of such purchase, sale, or use

prior to the application for a patent as aforesaid, except on proof of abandonment of such invention to the public, or that such purchase, sale or prior use, has been for more than two years prior to such application for a patent.

Section 8. *And be it further enacted*, That so much of the eleventh section of the above recited act as requires the payment of three dollars to the Commissioner of Patents for recording any assignment, grant or conveyance of the whole or any part of the interest or right under any patent, be, and the same is hereby repealed; and all such assignments, grants, and conveyances shall, in future, be recorded without any charge whatever.

Section 9. *And be it further enacted*, That a sum of money, not exceeding one thousand dollars, be, and the same is hereby, appropriated, out of the patent fund, to be expended by the Commissioner of Patents in the colection of agricultural statistics, and for other agricultural purposes; for which the said Commissioner shall account in his next annual report.

Section 10. *And be it further enacted*, That the provisions of the sixteenth section of the before recited act shall extend to all cases where patents are refused for any reason whatever, either by the Commissioner of Patents or by the Chief Justice of the District of Columbia, upon appeals from the decision of said Commissioner, as well as where the same shall have been refused on account of, or by reason of, interference with a previously existing patent; and in all cases where there is no opposing party, a copy of the bill shall be served upon the Commissioner of Patents, when the whole of the expenses of the proceeding shall be paid by the applicant, whether the final decision shall be in his favour or otherwise.

Section 11. *And be it further enacted*, That in cases where an appeal is now allowed by law from the decision of the Commissioner of Patents to a board of examiners provided for in the seventh section of the act to which this is additional, the party, instead thereof, shall have a right to appeal to the Chief Justice of the district court of the United States for the District of Columbia, by giving notice thereof to the Commissioner, and filing in the Patent Office, within such time as the Commissioner shall appoint, his reasons of appeal, specifically set forth in writing, and also paying into the Patent Office, to the credit of the patent fund, the sum of twenty-five dollars. And it shall be the duty of said Chief Justice, on petition, to hear and determine all such appeals, and to revise such decisions in a summary way, on the evidence produced before the Commissioner, at such early and convenient time as he may appoint, first notifying the Commissioner of the time and place of hearing, whose duty it shall be to give notice thereof to all parties who appear to be interested therein, in such manner as said judge shall prescribe. The Commissioner shall also lay before the said judge all the original papers and evidence in the case, together with the grounds of his decision, fully set forth in writing, touching all the points involved by the reasons of appeal, to which the revision shall be confined. And at the request of any party interested, or at the desire of the judge, the Commissioner and the examiners in the Patent Office, may be examined under oath, in explanation of the principles of the machine or other thing for which a patent, in such case, is prayed for. And it shall be the duty of said judge, after a hearing of any such case, to return all the papers to the Commissioner, with a certificate of his proceedings and decision, which shall be entered of record in the Patent Office; and such decision, so certified, shall govern the further proceedings of the Commissioner in such case: *Pro-*

vided, however, That no opinion or decision of the judge in any such case shall preclude any person interested in favour or against the validity of any patent which has been or may hereafter be granted, from the right to contest the same in any judicial court, in any action in which its validity may come in question.

SECTION 12. *And be it further enacted,* That the Commissioner of Patents shall have power to make all such regulations in respect to the taking of evidence to be used in contested cases before him, as may be just and reasonable. And so much of the act to which this is additional, as provides for a board of examiners, is hereby repealed.

SECTION 13. *And be it further enacted,* That there be paid annually, out of the patent fund, to the said Chief Justice, in consideration of the duties herein imposed, the sum of one hundred dollars.

Approved, March 3d, 1839.

LIST OF AMERICAN PATENTS WHICH ISSUED IN JUNE, 1839,

With Remarks and Exemplifications by the Editor.

1. For *Valves for Canal Locks;* William Lake, Richmond, Virginia, June 7.

The patentee remarks, that "the valves of canal locks are subject to a pressure, the intensity of which is measured by the height of the head and the area of the valves; and this pressure on the common sliding valves for locks of ordinary lifts, is of such magnitude, and requires the application of so great a force to open them as greatly to detract from the superiority which they otherwise possess."

"My improvement consists in giving such form to the valves and apertures that, by the momentary application of a very small force in opening a small orifice, I apply the hydrostatic pressure in such a manner as to open the valves. Upon the back of the valves, closing the aperture through which the water flows in filling and discharging the lock, I attach a flanch of the same length as that of the aperture, and of such a width as to have the same proportion to the width of the valve as the friction of the valve on the seat has to the pressure. At the lower edge of the valve, below the flanch, I make an orifice of about one inch in width and about half the length of the valve; this orifice I open and shut by means of a lever and connecting rod."

We were about to make further extracts from the specification, but find that in so doing we must occupy more space than is convenient to allow to the subject; and after all, should probably fail to give a clear idea of the construction without the aid of the drawing; we, therefore, skip over to the concluding paragraph.

"I have represented the valve as fixed in a lock-gate, but I by no means intend to restrict myself in my said improvement to valves placed in this particular situation; neither do I claim as my invention the manner of applying the lever and screw as exhibited in the drawing. What I do claim as my invention, and desire to secure by letters patent, is the application of the hydrostatic pressure, to open sliding valves for canal and river locks, and making such improvements in the construction of the said valves, and

in the form of the apertures to which they are applied, as will adapt them to the application of this pressure, as herein described."

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2. For an improvement in *Lamps;* Patrick J. Clark, Meriden, New Haven county, Connecticut, June 7.

The improvement is in the screw head tube and feeder, and is represented as applied to common chamber lamps. "The object is to fill, or feed the lamp through an orifice in the cap of the screw head, without removing it, and without the use of a separate feeding tube, thereby making a neater article, more easily managed and kept clean, and less liable to leakage and to accidents."

The screw-cap is to be perforated on one side of the wick, between the wick and the rim, so as to form a semicircular opening through which oil may be poured. A separate cap, perforated to allow the wick-tubes to pass through, slips on over the screw-cap, and is to be held in place by a pin. The claim is to "the improved mode of constructing the screw head for lamps, which consists in forming them with an aperture on one side of the wick, through which the oil can be poured, as herein specified. I also claim the cap, and the mode of securing that and the wick as specified."

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3. For *Stirrups* for saddles; John Carrel, Petersburg, Dinwiddie county, Virginia, June 7.

The general construction of this *spring stirrup* is made known in the claim which is "to the employment of a spring acting in a suitable frame at the top of the stirrup; said spring, with its appurtenances, being constructed, combined, and operating substantially in the manner herein set forth, its object and use being to relieve the rider from the effects of those sudden jerks which are frequently experienced when riding with stirrups of the ordinary construction."

The stirrup-strap is attached to a sliding-piece, above which there is another sliding-piece borne down by a spiral spring, the whole being contained in a frame occupying the ordinary place of the eye at the top of the stirrup.

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4. For improvements in the machinery for *Spinning Wool;* Isaac B. Hartwell, Northfield, Washington county, Vermont, June 7, antedated February 22.

The specification of this patent occupies twenty-six pages of record, and refers throughout to drawings. The claim, if given, would not afford any light as to the construction of the respective parts, and we are compelled, therefore, to abandon the task of furnishing a brief description of this apparatus.

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5. For an improvement in the *Boot Crimp;* Joseph Sanderson, Cincinnati, Hamilton county, Ohio, June 7.

"The invention claimed, consists in the construction of the wedge-shaped mortise and key, with grooves, tongues, and offsets, for the insertion of, and holding the edges of the upper, or leather, whilst crimping it."

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6. For an improvement in the *Cotton Gin*; Henry Conklin, Poughkeepsie, Dutchess county, New York, June 7.

This gin is of the roller kind, intended for the ginning of long staple

cotton. In a suitable frame there are "two rollers about one and a half inch in diameter, made of wood, iron, or other metallic substance;" directly in front of the said two rollers, and close to the junction of them, is fixed a *detainer*, about three thirty-second parts of an inch in diameter, to stop the seeds of the cotton, and thus prevent their coming in contact with, and being crushed by, the rollers, while they draw the cotton from them; the detainer may be made of iron, or any other substance, and is strained tight by screws, or in any other manner that will answer the purpose. "What I claim is the detainer placed in front of the rollers, as described."

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7. For an improvement in the *Machine for twisting Silk;* Gamaliel Gay, Philadelphia, June 7.

The device which is the subject of the patent before us, is denominated by Mr. Gay, a delivering roller, and will be found in the description of that gentleman's machinery, Vol. xxiv. p. 175. The claim is to "the combination of a roller, such as is described, with the machinery for twisting silk; said roller being constructed with a hollow, or groove, around which the thread, or fibre, is to be wound in its passage to the spindle."

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8. For *Preventing Friction in the steps of Vertical Shafts;* Stephen Parsons, Edgecombe, Lincoln county, Maine, June 7.

"The nature of my invention consists in providing a set of anti-friction washers, of a particular construction, placing them under and around the end of a perpendicular shaft, spindle, or pivot of a shaft; or when the nature of the case requires it, I reverse this order, and place said washers in the end of a shaft or gudgeon."

We shall not stop to give the particulars of the manner in which the patentee forms his washers, as the general intention will be perfectly apparent; but will dismiss the matter by confessing that we cannot see why the placing of several washers, one above the other, should decrease the friction, as we do not believe that there will be any motion excepting at the lower end of the spindle, or between some two of the washers.

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9. For *Making Hub-bands for Carriage Wheels;* Samuel Farrand, city of Newark, New Jersey, June 11.

The claim under this patent is to "the manufacture of hub-bands for carriage wheels, by means of rollers formed and operating substantially in the manner herein described;" and in this manner of operating there is very little novelty; although, it seems that the office found enough in it upon which to grant a patent, which should, most assuredly, be done whenever there appears to be any thing that is new in the thing claimed; this novelty, however, be it more or less, should be distinctly pointed out, which was not attempted in the foregoing claim.

The machine consists of two rollers, mounted in the manner of those of a flatting mill, the ends projecting through one end of the frame so as to admit the passing of the welded band to be rolled between them. The upper roller rises by the action of a spring, and is forced down by that of a screw; and when the hub-band is placed between the rollers, the upper one may be forced down, the band being kept in place by a sliding poppet on the bed of the machine.

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10. For *Cutting Screws on Wooden Framing;* S. H. Wills, Abington, Washington county, Virginia, June 18.

This machine is said to be for cutting right and left male and female screws for framing purposes. The principal object, we suppose, is to cut such screws upon the posts and rails of bedsteads, in such manner as that the screw at each end of the rail shall come up to a shoulder in each post, so as to cause them all to stand correctly with each other. This is not the first machine that has been patented for that purpose, and we have no doubt that there would soon be twenty others were they in demand. It would be a waste of time and space to attempt a description of the particular arrangements made by the present patentee, or to give the claims, as they refer to this special arrangement. If we wanted a machine for such a purpose we should not find the slightest difficulty in making one, without obtaining, or infringing, the right of any patentee.

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11. For an improvement in *Locks for Doors, &c.;* Erastus Finney, Cleaveland, Cuyahoga county, Ohio, June 18.

This is a combination lock, in which circular plates, or disks, are to be set by means of letters, or figures, under the particular arrangement made by the patentee. In the numerous devices of this kind there is usually much more of ingenuity than of utility, and they stand no chance whatever, therefore, of coming into general use. The claim made in the present instance is to "the employment of a cylinder revolving within a socket, or two or more cylinders revolving one within the other, having holes in their peripheries which can be made to coincide, or not, in the manner and for the purpose described."

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12. For an improvement in *Spectacles;* Daniel Thoxter, Hingham, Plymouth county, Massachusetts, June 18.

These spectacles are of the kind which have side glasses united by joint pins to the frame of the front glasses, and the improvement claimed consists in the manner of constructing "the joints uniting the frames of the front and side glasses so as to bring the front and side glasses into contact; and also the attaching the bows to the frames of the side glasses instead of continuing them across the side glasses to the joints, substantially as described."

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13. For a *Straw-Cutter;* Willis Grantham, Marshall's Ferry, Grainger county, Tennessee, June 18.

In this straw-cutter the straw is to be placed vertically in a hopper situated over a revolving cylinder, which carries a knife at such distance from its periphery as shall conform with the length of the cut stuff. A block within the hopper is made to press the straw during the time the knife is cutting, the pressure being removed in the interval to allow the straw to descend.

The claim is to the combination of the vertical hopper, feed-roller, apron, and press-block; and these parts thus combined in combination with the rotary diagonal knife, in manner substantially as set forth.

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14. For an improvement in *Rake Teeth;* Hezekiah Haynes, Middletown, Rutland county, Vermont, June 18.

The teeth of this rake are made of wire, inserted in, or secured to, the rake head, and then bent round said head so as to form a spiral spring. The pa-

tentee does not claim the forming the teeth of elastic wire, but only "the obtaining this elasticity more effectually by coiling the wire of which the teeth are made around the head of the rake, in the manner and for the purpose described."

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15. For an improvement in *Stoves;* Horace Bushnell, Hartford, Connecticut, June 21.

This patent is taken, mainly, for the construction of an oval valve, and the manner of placing it in a stove pipe, so as to change the direction of the draught, after a coal fire has been lighted, causing it to descend, and circulate through greater length of pipe, or other heating surface. In the object to be attained, there is here no novelty, and in the means of accomplishing it, just enough upon which to found a claim; with regard to utility, the same amount of this has been obtained by analogous arrangements.

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16. For *Cutting Boots and Shoes;* Jeremiah B. Keen, Bridgeton, Cumberland county, New Jersey, June 21.

"The principal features of this improvement in making boots and shoes, consist in cutting the vamp, quarters, and sole, in a single piece, instead of in several pieces as heretofore, and thereby having but one seam, the vamp, and that at the side; and in cutting a half stiffening to each quarter; which system will enable the maker to extend the cut from a shoe to a boot, which will entirely prevent the necessity of crimping." Patterns are exhibited in the drawing, showing the manner of cutting, and to these patterns the claims refer.

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17. For *Reversing the Motion of Steam Engines;* Jacob D. Custer, Norristown, Montgomery county, Pennsylvania, June 21.

Claim.—"What I claim as my invention is the attaching of the governor balls in steam engines to the fly wheel of the engine, and the connecting them to the eccentric in the manner herein specified, by which means the eccentric is made to move backwards and forwards in relation to the dead points of the crank, and thus cuts off the steam shorter or longer.—Also, the mode of reversing the motion of the steam engine by means of a spring-latch attached to the tube of the shifting eccentric; which latch has a projecting pin upon it, which falls into notches placed on the nave of the wheel, and out of which notches the latch is raised by means of a lever and ring when the engine is in motion, as described."

The description of the manner of applying these devices is of great length, and has numerous references to drawings.

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18. For *Springs for Railroad Cars;* Patrick Riley, Shamokin, Northumberland county, Pennsylvania, June 21.

A bow-spring under the side timbers of the carriage, has its middle resting on the axle boxes; and its ends bearing against strong spiral springs contained in tubes fixed to the underside of the rail. The claim is to "the application of the spiral springs combined with the inverted arch, or bow-spring, or plate, to locomotives, railroad cars, or other objects, in the manner described."

19. For an improvement in *Cocks applicable to the drawing of Molasses, &c.;* Charles F. Johnson, and John J. Speed, Ithaca, Tompkins county, New York, June 21.

To the back end of the cock, which is inserted in the barrel, a conical valve is adapted, and from this a wire rod extends along the axis of the cock, passing through its fore-end. By pressing against a button on the end of this rod, the valve is forced back, and the liquid runs out. To close the cock, the valve is drawn forward, it having been found that a spiral, or other spring is not necessary to its being securely closed. The claim is to "a stop-cock furnished with a simple conical valve, and operating by means of a rod, without spiral or other springs, as set forth."

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20. For *ascending and descending Inclined Planes on Railroads;* Jonn Mercer, Harrisville, Harrison county, Ohio, June 21.

The proposed mode of ascending inclined planes is much like several others patented, or proposed. There is to be a cogged rail on the centre of the track, into which a wheel on the under side of the locomotive is to gear. The cogs, or teeth, are on the sides of the rail, the top being smooth. The cogs are placed alternately on the opposite sides of this centre rail. The claim is to "the peculiar construction of the centre wheel, being in two parts connected together so as to bring the cogs of one wheel opposite the spaces of the other;—and the peculiar construction of the cogged rail, in having cogs projecting from the sides thereof, to prevent the lodgment of obstructions on the rack; the cogs on one side being opposite the spaces between them on the other, and the section of the rail at the commencement of the inclined plane having its teeth made triangular for the gradual and easy introduction of the cog wheel to the rack."

The plan proposed, and above set forth, does not obviate any of the essential objections to the ascending of inclined planes by means of rack-rails. The friction of rack-rails on level ground is very great, but on inclined planes it is greatly increased; there is from this cause a perpetual danger of the lifting of the locomotive, besides other difficulties which need not now be urged.

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21. For an improved *Emery Wheel for dressing Iron;* John G. Tibbots, city of New York, June 21.

The emery wheel, made in the usual manner, is to be suspended in a frame, or at the end of arms, which can rise or fall at pleasure. The iron, or other article to be dressed, is placed on a suitable table, the top of which may be made to move laterally. The wheel may be driven by bands and whirls in the usual way. The claim is to the mode of suspending the emery wheel, by means of the balance hanging frame, in combination with curved guides.

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22. For *ascending and descending Inclined Planes on Railroads;* John Drummond, Elizabethtown, Essex county, New Jersey, June 21.

Among the various plans for ascending inclined planes, that before us appears to be one of the least promising. The locomotive and cars are to be driven on to a carriage at the foot of the inclined plane, the wheels of which carriage must rest upon rails, sufficiently below those of the ordina-

ry track to cause the top of the said carriage to coincide with them. Upon this carriage the locomotive is to be made to move up the plane by means of a contrivance superabundant in friction. On the face of a driving wheel on each side of the locomotive, there is to be a projecting fillet, in a spiral, or scroll-like, form, which is to take in between the teeth of rack-rails erected on posts on each side of the track; and by the turning of the driving wheels the load is to worm its way up.

We shall not take the time requisite to describe or descant upon the various devices referred to and described, for managing the apparatus, as we think that the leading principle is obviously liable to so many objections as to render this superfluous; nor shall we give the claim, as this refers to several things which we have not noticed.

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23. For an improvement in *Bedsteads;* John Hart, Nicholasville, Jessamine county, Kentucky, June 21.

The rails of this bedstead are to be let into the posts by round tenons, allowing the rails to revolve on them as on pivots. The rails are to be furnished with pins upon which to hitch the rope, or sacking cord. There are levers let into holes in the side and foot-rails, which when the rope is hitched on to the pins, have one of their ends on the floor; these levers are to be raised to a horizontal position, thereby revolving the rails, and tightening the cords; the levers are then to be fastened by a rope, or otherwise, in the horizontal position. The arrangement and combination of the rails and levers constitute the claim, and a very vulnerable arrangement we think it; in this respect however, it does not stand alone, excepting in so far as it may belong to the bottom of its class.

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24. For making *Cotton Roving*; Jesse Whitehead, Manchester, Chesterfield county, Virginia, June 24.

"The nature of my invention consists in a method of giving to the spools of a countertwist speeder, a steady receding motion, regulated by the increasing diameter of the bobbin, to preserve the same distance between the surface of the bobbin and the guide through which the roving passes, by means of the application of stationary inclines, or guides, to the frames of the bars holding the spools."

The claim is nearly in the foregoing words, containing the statement of the design of the invention. The manner of carrying this design into effect could not be made known without reference to the drawings.

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25. For a *Corn-Sheller, Hulling Grain, &c.;* John Mercer Harrison, Harrisville, Harrison county, Ohio, June 24.

This machine consists of a cylinder revolving within a concave, the surface of which being covered with segments of cast iron, ridged in a way described and represented in the drawing; the parts being regulated by tempering screws. The peculiar arrangement of these parts constitutes the claim, but this is not very clearly described or represented. So far as we can see into the matter, without devoting more attention to it than is convenient, we do not find any thing worthy of special notice.

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26. For a *Planting Machine;* Moses Atwood, Jr., Hempstead, Rockingham county, New Hampshire, June 24.

This machine is intended for planting corn, and other large seeds; its general character assimilates it to a number of others made for a like purpose, but there is considerable peculiarity in the arrangement of its parts, and this arrangement constitutes the subject matter of the claims, which are to "the combination of the box containing the corn to be planted, with a pulley-box and small hopper, and adjustable bucket-belt, with its buckets for taking up the corn. Also, in combination with this arrangement, the adjusting bar for regulating the length of the bucket-belt; the lever and slide for regulating the supply of corn to the pulley-box; the lever and slide contained in the pulley-box for admitting and shutting off the supply of corn to the same, together with the pulleys and cam for lifting the levers so as to admit a supply of corn into the pulley-box, all substantially as described."

After this long catalogue of items, no one, we believe, will expect, or desire, a description of the respective parts, and, without further information, the inference appears to be a necessary one, that where a patent is dependent upon so many small particulars, without any leading feature of novelty, to stand out in bold relief, its loop-holes must be numerous.

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27. For machinery which may be used in *Spinning Hemp, Flax, and other fibrous materials;* Moses Day, Roxbury, Norfolk county, Massachusetts, June 24.

This is said to be "an improvement in machinery for producing a reciprocating motion," which is applicable to the above named purposes—the invention being for "the object and purpose of producing a rectiliniar motion of the bobbin or spool, through the flyer, in order to distribute or wind the yarn on the bobbin as the same is spun or twisted, or delivered, by the regulating capstan." The method of giving the reciprocating motion to the bobbin is, by cutting a right and left-handed screw, upon the same portion of a shaft, or spindle, the threads crossing each other, into the threads of which screw a guide-piece fits, which guide-piece is so arranged as that by shifting it, the motion may be reversed, and rendered reciprocating; so far there is not any novelty in the plan, but by means of a pulley, with its tongue, or fork, and certain other parts represented, and claimed, a screw with coarse threads may be used, so as to lessen the friction, and still produce the desired effect. Whether the manner described of producing the reciprocating motion is superior to others before in use, is a question which we are not prepared to answer.

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28. For a machine for *Hulling Clover and other Seeds;* Abraham Keagey, Morrison's Cove, Bedford county, Pennsylvania, June 24.

In this machine there is a combination of rubbing cylinders, and concaves, wind passages, and a blowing apparatus, which has the merit of ingenuity and of some novelty. The claim is to certain peculiarities in the arrangement of the parts, including "two hulling cylinders revolving in the same direction, furnished with rows of teeth and graters, alternately, as set forth, and having a double concave grater above the said cylinders, with the respective apertures combined and connected as described."

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29. For an improvement in the mode of *Manufacturing Carbonate of Soda;* John Hemming, of England, and Edward Dyer, a citizen of the United States, June 24.

The specification of this patent is published in Vol. XIV. of Newton's Journal, p. 400, and from this we republish it, the English and American patents being similar.

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30. For improvements in the construction of *Bridges;* Henry Wilton, Wrightsville, York county, Pennsylvania, June 24.

"The nature of these improvements consists in combining the right line, or horizontal bridge, with the arch bridge, in a peculiar manner." The general construction of this bridge is the same with that patented by Mr. Town, the sides, or trusses, consisting of lattice work, composed of small timbers pinned together at their crossings. Two of these are to be connected together by transverse beams and diagonal braces; and arches are to be arranged at the sides of the trusses, one on each side of each truss, the ends of which arches have their bearings or off-sets on the abutments and piers, between the floor of the bridge. The arches on each side of each truss are to be screwed together by screw-bolts.

The claims are to the employment of vertical braces, and the horizontal bolts, in combining the arch with the right line or lattice bridge.

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31. For an *Umbrella Runner;* Joseph Barnhurst, Francisville, Philadelphia county, Pennsylvania, June 25.

This patent is taken for an improvement upon an umbrella runner, of French invention, consisting of two tubes, one of which is contained, and turns to a certain distance, within the other, for fastening the umbrella when open. The difference between the two runners is not great, but sufficient novelty and utility was found in the improvement to cause it to be deemed worthy of a patent; it would not, however, be a very interesting matter to give a long detail of these minor differences in constructing and arranging said tubes.

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32. For a *Planting Machine;* John W. Forrest, Princess Ann Court House, Virginia, June 25.

A hollow wheel, or drum, is to roll upon the ground, its axis running in a suitable frame; within this drum the seed is to be placed, and it is to drop through a hole, or holes, in its periphery. For corn, and other large seeds, there may be but one hole, but for small grain the periphery of the drum is to be perforated with numerous holes. "This invention may be attached either to a harrow or a plough, and by widening the cylinder and increasing the number of holes, may be used for broad cast, and this invention as thus set forth, is all that I do claim, it being distinct from the plough, harrow, mould-boards, and outer plough frame, which I do not claim."

This seems to us to be one among the least promising of all the planting and sowing machines which we have had occasion to notice, it being deficient in the provisions which appear necessary to equal dissemination, a point of great importance in the operation.

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33. For a *Stump Machine*; Benjamin Burling, Catharine, Chemung county, New York, June 25.

This is a very simple machine, "consisting of a lever, which is usually from fourteen to twenty feet in length, to one end of which is fixed a clevis, furnished with hooks, or dogs, or other contrivances, for taking hold of the

stump. The end upon which the lever bears, and which constitutes its fulcrum, is formed into a quadrant of a circle, which is to be sustained upon a proper bearing, or bed piece, placed upon the ground, and upon which the curved part of the lever rolls as the stump is extracted. When the dogs or hooks of the lever are first attached to the stump to be raised, said lever is placed in a vertical position; it is to be drawn down, and the stump raised, by animal or other power, drawing by ropes or chains attached to its upper end." The step upon which the curved lever rests may be made of strong planks, and have cheek pieces, forming it into a trough, which, presenting a wide bottom, will not sink into the ground. The claim made is to the manner of constructing the foregoing apparatus "so that by the operation of the curved end of the lever, resting on the step, and furnished with the clevis and dogs, formed and operating substantially as set forth, stumps may be raised and extracted from the ground, in the manner described."

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34. For a *Safety Hook, for tow lines;* Thomas Jackson, Reading, Berks county, Pennsylvania, June 25.

This is a safety hook which is to be attached to a swingle tree, for towing canal boats. "In this safety hook the towing line may be cast off and replaced without the necessity of making use of the trigger, which is not the case with those formerly used. The trigger also must be disengaged by pressing on it below instead of above, whilst in the old hooks it was acted upon on the upper side, and was not unfrequently disengaged accidentally by a blow from the tail of the horse, a thing which cannot possibly occur under the present arrangement."

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35. For *Preventing Smoke, and Saving Fuel*; Sarah Hammond, city of Baltimore, June 25.

The claims under this patent are, "First, the constructing of a hearth on the base of an ordinary fire place, of the form specified, by which means a raised flue is formed between the top of the centre of this hearth, which is lower than the ends, and the bars or grate on which I place the fuel."

"Secondly, the placing of the bars for supporting this fuel on the top of the raised hearth, from end to end, across the said flue, as herein described."

"Thirdly, the placing of the fender along the upper edge of the raised hearth, from jamb to jamb, across the said flue."

"Lastly, I claim the said hearth, fire grate, and fender, in combination, all as specified."

The whole device referred to in the above claims, consists of an elevation formed on the common hearth, even with the jambs, and probably eight or ten inches in height. In the centre of this elevation there is a recess, which is to form a flue and an ash pit; on the top of this are to be laid grate bars, which are flush with the elevated hearth; a fender is placed in front, to prevent the fuel from falling down, and behind the bars there is to be a soap stone back log.

Imitating the politeness of the officers who granted this patent, we will not offer a word of discouragement to the fair patentee, but will indulge the hope that her hearth may be one of comfort, and her fire place one of profit.

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36. For *Broom Heads*; Isaac Cheney, Leyden, Franklin county, Massachusetts, June 25.

A piece of sheet metal, cut into proper form, is to be doubled over, so as to embrace the fibres forming the brush between them. Through the edges of this clasp, wires furnished with screw nuts are to pass, and by tightening them the fibres will be bound together. A ferule to receive a handle may be affixed to the upper part of the clasp. The claim is to the foregoing mode of making and fastening broom heads.

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37. For a *Machine for Cutting and Grinding Corn with the Cobs*; Joseph C. Baldwin, Augusta county, and Cyrus B. Baldwin, Batetout county, Virginia, June 26.

The claim under this patent will afford a good general idea of the construction of the machine as claimed; it is as follows:

"We do not claim to be the inventors of toothed iron cylinders, or to be the first who have applied them to the grinding and crushing of corn and other grain; but we do claim to be the inventors of a machine for that purpose such as is herein described, in which the article to be crushed or ground is successively acted upon by crushing and grinding cylinders standing in part the one over the other, and combined with a small grinding cylinder and concave, constructed and operating substantially in the manner set forth."

The cylinders are of cast-iron, fluted or ridged, and running together with different velocities. The arrangements appear to be good, and the machine is said to be effective.

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38. For an improvement in *Clocks*; Noble Jerome, Bristol, Hartford county, Connecticut, June 27.

We cannot attempt to explain the nature of the respective improvements which constitute the subject of this patent. The manner of placing the count wheel on a stand or socket; of confining it by means of a spring; the making of the count wheel of a single plate of metal; the moving of it by means of a single dog, together with certain other matters, constitute the things claimed.

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39. For a *Portable Oven*; Thaddeus B. Curtis, New Dover, Connecticut, June 27.

This oven is formed of double plates, as also are the shelves within it, the spaces constituting flues through which the draught is to be made to pass back and forth. By connecting the pipe of a cylindrical, or other, stove, with the lower part of this oven, and having a pipe at its upper part, to lead into a chimney, the oven may be heated. To an oven so combined and arranged the claim is made.

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40. For a Machine for *Counting Pills*; Joseph Priestly Peters, city of New York, June 27.

"I make a trough or box, which I divide into three or more compartments, extending from one side of it to the other; the two end compartments only, when there are three, constitute the hoppers into which the pills or other substances to be counted are to be put. To this trough I adapt a sliding bottom which is perforated with holes, the thickness of said bottom, and the diameter of the holes being governed by the size of the bodies to be counted. When the perforated part of this bottom is made to occupy the

lower part of one of the hoppers, one of the spherical bodies contained in said hoppers will fall into each of the holes or perforations, and may be carried by the sliding of the bottom into the centre division of the trough or box, whence each of them is to fall, and be conducted by means of a suitable funnel into a box placed below to receive them." There is, of course, under the perforated slide, a solid bottom to each hopper, whilst the middle compartment is open below. The boxes to receive the pills, &c., are placed upon a sliding shelf below the funnel, which shelf is regularly moved forward.

The claims are to "the manner of separating and counting the proper number of such bodies, by causing them to be received within perforations prepared for and adapted to them, whether in a sliding, vibrating, or rotating portion of the machine, so arranged as to operate substantially in the manner of the sliding bottom and its appurtenances, as herein described; by means of which they are conveyed from a hopper or compartment in which they are placed, and delivered into a funnel, and by that conducted into the boxes or other receptacles arranged for that purpose, as set forth."

The above described machine is simple in its construction, and perfect in its operation. We say so because we have had occasion to try it; but even without this there would not have been any difficulty in deciding upon its merits.

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41. For *Sawing Blocks for Friction Matches;* Jonathan Morgan, Portland, Maine, June 27.

Blocks for friction matches, it is generally known, are cut by gangs of circular saws so as to cut nearly through the block, but yet to leave the matches attached to each other at one end; the present patent is taken for adding to the gang one additional saw of larger diameter than the others, which shall separate the individual blocks from each other. The additional saw is the only thing claimed.

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42. For *Trusses for Hernia and Prolapsus Uteri:* John M. Sinton, Hacketstown, Warren county, New Jersey, June 27.

The patentee says, "In my truss I do not make use of a spring to pass round the body and make counter pressure on the back; but the apparatus to which the pad or pads are attached, consists of a corset or jacket, reaching round the body and laced or tied behind, in the manner of ordinary corsets. When my truss is employed for the relief or cure of Hernia, I employ two pads, although the rupture may be on one side of the groin only, a plan to which I have recourse not only because the particular structure of my truss requires it, but also because by this means the pressure upon the rupture is rendered more equable, and as affording security against the occurrence of rupture on the sound side. When my truss is used for prolapsus uteri, I adopt a larger pad suited to the purpose, to take the place of the hernial pads." The piece to which the pads are attached passes up like a corset bone, but has a sliding motion up and down, and at its lower part there is a ratchet and catch, to alter the pressure of the pads, attached to two spring pieces, which, however, are not to have much elasticity.

The claims are to the combination of the spring pieces which carry the pads with the sliding piece, attached to and operating in a jacket or corset, as described.

43. For an improvement in *Piano Fortes:* John J. Wise, Baltimore, Maryland, June 27.

This patent is taken for an improvement on the German action, the particular arrangements of the parts we shall not attempt to describe, but content ourselves, and probably most of our readers also, by giving the claim, which is to the combination of a detached key with a lever at its inner end, having its fulcrum at the back of the piano, and projecting over the inner end of the key, by which it is raised when the key is forced down; and having the capsel, or upright, which carries the hammer, attached to the end projecting over the key, instead of being attached to the key as in the German action; and in combination with the above, the placing of the catch (which operates in the same manner as in the German action,) nearer the key board than the hammer is, the position of the hammer handle being reversed, which is the opposite of the German action; combining with this arrangement the regulating screw, as described in the specification.

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44. For *casting a Double Suction Pump:* Foster Hevshard, Brookfield, Worcester county, Massachusetts, June 29.

The specification and drawings present a particular mode of combining iron rods around which the cores for casting the pumps are to be formed, so as conveniently to cast the barrels of a double forcing pump in one piece; and the claim made is to the particular arrangement of these rods, which is such as to enable them to be detached, by unscrewing, from the parts with which they are connected.

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45. For improvements in the *Suction and Lifting Pumps:* Humphrey L. Hughes, Warren county, Virginia, June 29.

In the specification of this pump a number of proposed improvements are described, but they consist, in general, of devices substantially the same with such as are known to those familiar with what has been done in this way, and the claim, therefore, is restricted to a single item of these proposed improvements, the object of which is to facilitate the removal of the lower box; this is effected by giving to the bale which rises from that box considerable length, so that it shall rise to a height above the box, more than equal to that of the stroke of the pump. An iron rod extends down from the upper box, or piston, and slides through a hole in the top of the bale; this rod has a head at its lower end, and, consequently, when the upper box is raised, it draws the lower box with it. The claim is to this arrangement, which is one that we, most certainly, would not use, for various reasons; among which are the following: The sliding bolt has to be lifted perpetually, in addition to the weight of the other parts; the piston cannot be removed without also removing the lower valve, which must therefore be disturbed, whether it is required or not; and lastly, it obviates no difficulty, as the lower box may be easily hooked up when necessary, which ought not to be once in a year. A common mistake in the theory of the pressure of water is put forth in this specification, namely, that "the box of the pump stock is generally too large, causing too great a weight of water to rest on the valves." Now it so happens that this weight is proportioned to the altitude and the size of the valve, and bears no relationship whatever to the size of the bore of the pump.

46. For *Cutting Staves:* Jonathan Burt, of Sullivan, and Erasmus Smith, of Norwich, Chenango county, New York, June 29.

A knife, properly curved, is placed upon two arms, the length of which corresponds with the curvature to be given to the stave crosswise. A crank shaft, having a crank at each end, is connected to the arms by two shackle bars, which, when the shaft is made to revolve, give a reciprocating motion to the knife. The stuff to be cut is to be steamed, and fed up to the knife by means of a suitable apparatus; the knife must, of course, be as long as the stave to be cut.

The claim is to "the mode of communicating motion to the cutting knife from the crank shaft placed below it, whilst the knife itself is made to move in the proper curve to be given to the stave, by means of the arms upon which it is hung."

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47. For a *Truss for Prolapsus Uteri:* Albran Pateet, Danville, Hendricks county, Indiana, June 29.

There is not anything of a special character in this truss by which to designate it, but simply some variation of arrangement; the claims are to the manner of constructing the spring which passes round the body, in combination with a bifurcated strap attached to its end, in the manner represented in the drawing.

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48. For *Window Blind Fastenings:* Mileden N. Isbel, New Haven, Connecticut, June 29.

This patent is taken for merely adding a spiral spring to certain well known blind and shutter fastenings, so as to insure their action as latches, or catches, instead of depending upon their gravity alone.

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49. For a machine for *Cleaning Wheat:* George Mann, jr., Lockport, Niagara county, New York, June 29.

This machine, like most others for the same purpose, presents the form of a vertical cylinder, the exterior of which consists of vertical staves, or grating, the bars composing which are placed at such distances apart as to allow dust to pass out between them; the revolving part within causes the grain to be rubbed against cast-iron flutes, and perforated sheet iron, the latter operating like a grater; the wheat is also to be rubbed, as it descends, by revolving brushes against the interior of the cylinder. Air is to be drawn in through tin tubes, which air, as it passes out between the staves, is to carry with it the dust produced by the friction of the grain. The claims are to the making the cylindrical case with openings as described; to the combination of the fluted rubbers and brushes; and to the combination of the rubbers forming the top of the cylindrical case, and a revolving disk below it.

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50. For an improvement in *Spectacles:* Christopher H. Smith, Niagara Falls, Niagara county, New York, June 29.

The frames of these spectacles are to be made like those in common use, with temple frames of the ordinary construction, but there are not to be glasses in the eye frames, these being left vacant. There are, however, to be two pair of eye glasses in separate frames, one pair of which may be turned back against the inner side of the temple frame in a manner well

known; the other pair are so hinged that they may be turned back against the outsides of the temple frames, or brought round so as to cover the open eye frames, at pleasure. The glasses may be coloured, if required; they may also have different focal lengths, and may be used singly or combined, so as to furnish three different focal distances. The patentee calls those "revolving glasses," which turn back outside of the frame, as they turn three fourths of a circle.

The claim is to "the employment in spectacles of the revolving glasses, and the manner of screwing them to the rim, or apertures of the frames; also, to the mode of securing them to the outside of the temple bows." This latter claim refers to a catch by which the glasses when turned back, are held in place.

Specifications of English Patents.

Specification of a patent granted to Henry Griffiths, *of the county of Middlesex, for improvements in the process of producing prints or impressions from steel, copper, or other plates.*—[Sealed 25th of May, 1839.

These improvements in the process of producing prints or impressions from steel, copper, and other plates, have for their object the production of imitations of drawings, by several successive operations of printing different colours or tints upon paper or other suitable material, each successive impression being so carefully placed as to register with perfect accuracy and fit the previous impression, in order that, when the several successive impressions have been so taken upon one sheet, tablet, or surface of paper, or other material, the whole shall produce the effect of a drawing or picture delineated in its various tints or colours with a camel's hair or other pencil.

In performing this process, it is necessary first to provide a series of three, four, or more plates of copper or steel, as many in number as may be required to produce the different gradations of tints or of colours in the drawing to be imitated; the plates must be produced severally by the ordinary processes of etching, stippling, qua-tinting, or mezzotinting, or other suitable modes of engraving the selected parts or portions of the drawing which are to be represented by the particular tint or colour printed from each individual plate.

When the several plates have been thus engraven, there must be lines or registering points marked upon all the plates accurately corresponding, in order that the first impression upon the paper may exactly register with the parts of the subject upon the successive plates.

The patentee has accompanied his specifications with a series of prints, taken in the several stages of the operation, which it must be obvious we are unable to give examples of; and proceed to state, in reference to the production of such subjects, the manner of proceeding.—

Supposing, he says, that I am about to print a flower in colours in imitation of a drawing,—I produce upon a plate, by some of the modes of engraving above alluded, the form of the pale yellow part of the flower, which I then print upon the paper; I next produce a plate, having only that part of the flower engraven on it which is to represent the central bright tint and the green stalk which I print upon the former impression. A third plate is then provided, having the forms of the shadows only; this is to be printed upon the two former. And, lastly, I produce a plate on which is engraven

the deep purple tint of the flower, and having printed the last upon the three preceding impressions, I hereby complete the picture of the flower.

Again, supposing that the subject of the drawing to be imitated is a landscape;—I engrave a plate with the forms only of the grey tints, representing hills and sky, and parts of the foreground, and having printed this, produce the imperfect or first stage of the picture; a second plate is then provided, having only the forms of the yellow tints of the drawing, which is to be printed on the previous impression, and which will thus give to the picture the second stage of advancement; a third plate is then to be employed, having only the shades of the brown colour and broad shadows of the picture, which being printed upon the two preceding impressions, gives a resemblance of the landscape drawing in a further advanced stage. Lastly, I provide a plate, having the stronger or more powerful parts of the picture engraven on it, and having printed this upon the three previous impressions, produce a finished copy of the drawing, which I desired to imitate.

The patentee further remarks, that he does not always print with oil colours, as some of the tints, designed to imitate water colours, would lose much of their brilliancy and delicacy if mixed with oil; he therefore sometimes employs moist water colours for printing; but, wherever brilliancy and purity are essential, he prefers to use the colours in a dry powdered state.

The process of printing with oil colour is so well known as to render any description of it unnecessary. That of printing from moist water colours has also been of late in use; but, if not generally known, it is merely necessary to observe, that the parts of the plate to be printed by moist water colours, are covered by a small dabber, and the smooth surface of the plate wiped clean by a damp rag.

In printing with dry colours, I first grind the colour with pure water or spirits of wine, and, when dry, reduce it to a very finely powdered state; I then apply the powdered or dry colour to the parts of the plate required by means of a camel's hair pencil, and carefully wipe off all the superfluous colour by the hand, or by a soft leather. The plate is then put into the press, and the damped paper laid upon it, and after the dry colour impression has been given to the paper, by passing the plate under the rollers, the successive impressions should be taken whilst the paper remains damp, excepting in cases where great force of colour is required, which may be promoted by drying the paper between each stage. Lond. Jour. Arts & Sci.

Specification of a patent granted to Moses Poole, *of the county of Middlesex, for improvements in constructing and applying boxes to wheels,—being a communication from a foreigner residing abroad.*—[Sealed 28th February, 1839.]

The patentee states, that considerable inconvenience and instability has been experienced from the ordinary mode of fastening into the wooden naves of wheels the iron boxes in which the axles run. That the longitudinal ribs usually formed on the outsides of the boxes, when inserted in its wooden naves and wedged up, soon become loose, to the great detriment of the proper action of the wheel. It is therefore proposed, as the subject of this patent, that the external surface of the iron box of a wheel, shall be

made with a helical thread or screw, winding several times round its periphery, in order that the box may be screwed tightly into the wooden nave, instead of fastening it in by ribs and wedges, as heretofore.

The screw may be formed on the outside of the iron box, by casting it in a threaded mould, or it may have a screw cut upon its outside in a lathe, or by other suitable or convenient means. The patentee does not confine himself to any particular sort of screw, but claims fixing the iron boxes of wheels in wooden naves by screwing them into the wood. Ibid.

Specification of a patent granted to Charles Wye Williams, *of Liverpool, in the county of Lancaster, for his invention of certain improvements in the process or the mode of purifying or preparing turpentine, rosin, pitch, tar, and other bituminous matters, whereby the power of giving out light and heat is increased, either when distilled or burnt as fuel.*—[Sealed 14th August, 1839.]

This invention consists in a peculiar mode of rendering the several bituminous matters, as turpentine, rosin, pitch, tar, &c. more effective, when used for the purpose of giving out either heat or light, by bringing such bitumens into intimate contact with atmospheric air, in order that several of the gases with which they are charged, and in particular the combination of ammoniacal gas, known to be injurious in the processes of burning for the production of light or heat. In order to afford the best information for carrying my said invention into effect, I give the following description of the process or means which I employ, namely:—I place the bitumen to be purified in a large pan, or vessel, over a fire,—and when raised to near the boiling point, I cause a second vessel, shaped and pierced with numerous holes, like a colander, to descend into the former; and when filled with the melted bitumen, to be raised suddenly a few feet, to allow the melted stuff to fall through in shower-like streams, by which, in the act of dripping down and returning to the first-mentioned pan, the melted material comes into extended contact with the atmosphere; the result of which is, that a large portion of the ammonia, and its combinations, and other gases, with which such bitumens are charged, are expelled or drawn off by the atmosphere.

This filtering or mixing process, by which the bitumen and atmospheric air are so brought in contact, is to be kept going on, until the material has received the required extent of purification, and which operation may be carried on as long as desired.

This process of lifting the bitumen, and allowing it to fall through the colander, or other shaped vessel pierced full of holes, may be effected by mechanical means, or simply by hand utensils.

The temperature to which the bitumen must be brought, should be about the boiling point; but varying, of course, according to the kind of bitumen operated on, and which a little practice will soon point out.

While this process is going on, I cause a strong current of atmospheric air to pass across the falling portions, drops, or streams, of the bitumen, by means of a fan or other well known mechanical means,—the object being to cause a larger admixture of air with the bitumen, in the act of falling or dripping down, and by which the ammoniacal and other gases, which are very volatile, are passed off in great quantities.

I do not intend to confine myself to bringing such bitumens to any par-

ticular temperature, or to continue this filtering or mixing process for any particular length of time; but intend to avail myself of any extent or continuance of this operation, until the air has sufficiently acted on the bitumen, with which it is thus mechanically brought into contact.

And whereas, the process of purifying the various bitumens above described, has been practised by other persons, I make no claim to purifying such materials by any other means; but I do claim that mode of purifying the same, by agitation and mechanical admixture with atmospheric air, and for the purpose of exposing extended surfaces of the bitumen to contact with atmospheric air. Ibid.

Specification of a patent granted to WILLIAM BANKS, *of the county of Warwick, for his invention of a certain improvement in machinery, pens, and presses, for ruling and pressing paper.*—[Sealed 17th August, 1835.]

This invention is a certain arrangement of machinery whereby paper may be ruled with lines of different colours, and submitted to hot or cold pressure at the same time.

The apparatus described in the specification, consists of a frame-work constructed of wood, iron, or other suitable material, and having at one end a flat table for holding the paper to be ruled and pressed. At the end of this table, and about the centre of the framing, two hollow rollers are placed, transversely, across the machine, and are mounted in suitable bearings, and are intended to press the paper.

Near these hollow rollers a cylindrical shaft or spindle (also placed transversely) is furnished with a number of instruments or pens for making the required lines. These pens are capable of very accurate adjustment as to the widths and thickness of the lines to be produced, and each pen is attached to a metal collar, which may be slidden along the cylindrical shaft, and firmly fixed in any required position, by means of a small thumb-screw attached to it.

Two metal or other rollers, one placed near the pressing rollers, and the other at the reverse end of the machine, carry tapes or bands for the purpose of keeping the paper, while being ruled, flat upon a wide endless band, which is extended across two rollers, placed below the tape rollers. A third roller, immediately under the points of the pens, raises up the endless band, and by that means keeps it in contact with the points, and also forms a solid and firm bed for the pens to act upon.

The paper to be ruled being placed on the table in front, is passed, sheet by sheet, between the hollow pressing rollers, which may, if required, be heated by means of hot irons. It is then conducted from them by the tape roller, and passed on to the endless band, and carried by that and the tapes under the points of the pens, from which it receives the required lines; it is thence carried forward by the tapes and endless cloth, and delivered at the other end of the machine on to a table, placed there for the purpose of receiving it.

The machine is set in motion by manual or other power, which is applied to one of the pressing rollers; the other parts of the apparatus being actuated by suitable gearing, or otherwise.

The pens are formed in such a manner that they will contain a sufficient quantity of ink to last for a considerable space of time without replenish-

ing; and each instrument being totally unconnected with any other, two, three, or more coloured lines may be ruled at one and the same time.

Ibid.

Specification of a patent granted to GEORGE NELSON, *of Milverton, county of Warwick, for his invention of a new or improved method, or new or improved methods of preparing gelatine, which has the properties of or resembles glue.*—[Sealed 23d March, 1839.]

This invention is described as consisting of an improved mode of preparing gelatine from the cuttings and trimmings of hides and skins, and is thus explained:—The cuttings, after been freed from the hair, fat, and other extraneous matters, are to be well washed in clear cold water. When sufficiently clean, the cuttings are to be submitted to the action of a solution of caustic alkali, made from common soda and fresh burnt lime, mixed with water. Previous to their being macerated, they should be scored all over to the depth of about the eighth of an inch, in order to facilitate the action of the alkali, in which they may be allowed to remain for about ten days; they should then be removed from the solution, and placed in an air-tight vat, lined with cement, and kept at a temperature of from sixty to seventy of Fahrenheit; after which they must be removed to a washing apparatus, consisting of a wooden cylinder, about three feet in diameter, which is made to revolve. A stream of water, being admitted into the cylinder, washes away all the alkali from the cuttings; and when sufficiently cleansed, they are removed to a wooden vessel, and submitted to the action of sulphurous acid gas, generated by the combustion of sulphur.

After this process, the water should be passed out of the cuttings, and they are then to be put into vessels, made of any material not liable to be acted upon by the acid,—such as earthenware,—and heated by steam, to the temperature of 150° Fahrenheit,—thus completing the process, the cuttings being then reduced to a gelatinous state. This product must be strained, in order to separate the pure gelatine from its residuum; and during this process, the gelatine is kept up to 100 or 120° Fahrenheit. Ibid.

Specification of a patent granted to THOMAS BONSOR CROMPTON, *of Farnworth, county of Lancaster, for certain improvements in the manufacture of paper.*—[Sealed 6th April, 1839.]

This invention consists of a new method of producing a vacuum in the wire cylinder, or in the vacuum box under the wire cloth, over which the paper passes in the course of manufacture.

The patentee produces a vacuum by means of a number of rotary fans placed in connection with the vacuum box, and which being made to revolve at a considerable velocity, exhaust the air in a continuous current.

The water contained in the paper is extracted from it, as it passes over the wire cylinder or wire cloth, by means of the air which presses on the surface of the paper as it endeavours to fill up the vacuum formed below. The water thus extracted is drawn off from the vacuum box by a syphon.

The patentee states, that paper made in apparatus with his improvement

attached thereto, will be found to be more even and regular in thickness than that which is made in a machine where the vacuum is caused by the reciprocating motion of a pump;—the thickness of the paper being rendered irregular by the uneven pressure of the atmosphere on its surface, occasioned by the air being exhausted in puffs. Ibid.

Specification of a patent granted to William Joynson, *of St. Mary Cray Paper Mills, Kent, for a certain improvement or improvements in the manufacture of paper.*—[Sealed February 21st, 1839.]

This patent is for a method of producing the water-mark, or maker's name, on paper. The method of effecting this may be thus explained:—

Projecting letters, figures, or devices, made of round or oval wire, are fixed to the dandy roller, which is a cylinder formed of an axle, having arms or rings projecting from it, and covered with wire cloth. The figures or letters are formed of wire, flattened on the side, by which they are attached to the roller, but having the upper side, or that which makes the indentation in the paper, of a round form.

The paper, in a pulpy state, being passed over this cylinder, is marked in those places that come into contact with the projecting devices, and form what is generally known as the water-mark. Ibid.

Specification of a patent granted to Alphonse Rene Le Mire De Normandy, *of the city of London, for certain improvements in the manufacture of inks and dyes.*—[Sealed 1st August, 1839.]

In the specification of this patent there are five distinct improvements or methods of obtaining inks and dyes, applicable to dyeing, staining, and writing.

The first improvement is for a method of superseding the use of nut-galls, and of correcting the green and brown precipitates obtained from combination of gallic acid and sulphate of iron, as in the manufacture of the common black inks now in use.

Secondly, for a method of treating campechy wood, (Hæmatoxylon Campechiacum,) for the purpose of obtaining a beautiful purple colour, called by the patentee, the "King of Purples."

The third improvement is for a method of rendering Chinese blue, or cyanoferruret of iron, soluble, so as to render it applicable to the manufacture of inks and dyes.

The fourth improvement is for the production of a solid or semi-solid soluble ink, which being in a solid form, may be easily rendered fit for use, as a writing ink, by adding a sufficient quantity of liquid.

The fifth and last improvement consists in combining carbon with certain acids for the production of a really indelible ink, which cannot be effaced by any chemical agent.

For the first improvement, instead of using nut-galls, the gallic acid is obtained from sumac, elm wood, chesnut, beech, willow, poplar, catechu, cherry, plum, or any other wood or berry, that contains gallic acid, or tannin, or both. The wood to be used, being first reduced to powder, is steeped in water, and combined with the hereinafter named substances, in about the following proportions. It is here observed, however, that the va-

rious woods require different quantities of water, according to their solubility; for instance, catechu, being nearly entirely soluble in water, will require a greater quantity than sumac; the patentee has therefore only given the proportions to be observed when sumac is used.

To make 340 gallons of ink, take from 12 to 15 sacks of sumac, of four bushels in the sack, and having obtained the decoction, add 200 weight of campechy; 80 lbs. or perhaps 100, weight of gum arabic; 100 weight of sulphate of protoxide of iron; acetate and hydrate of protoxide of copper, 4 lbs.; sulphate of alumine and potash, 37 lbs.; and of sulphate of indigo, 6 lbs.;—the quantity of this latter may be regulated according to the required intensity of the colour. If catechu is employed, then 100 weight will be found sufficient.

To produce a purple colour, called the "King of Purples," the following proportions must be observed:—To 12 lbs. of campechy wood add as many gallons of boiling water; pour the solution through a funnel, with a strainer made of coarse flannel, on to 1 lb. of hydrate or acetate of deutoxide of copper, finely pulverized, (at the bottom of the funnel a piece of sponge is placed;) then add immediately 14 lbs. of sulphate of alumine and potash, and for every 340 gallons of liquid add 80 lbs. of gum arabic or gum Senegal.—Let these remain for three or four days, and a beautiful purple colour will be produced.

The third improvement consists in an improved method of operating upon Chinese blue or cyanoferruret of iron. The cyanoferruret of iron is to be ground in water with oxalic acid, or bi-oxalate of potash, adding gum arabic in the following proportions:—To 7 oz. of water add three drachms of Chinese blue, 1 drachm of oxalate of potash, and 1 drachm of gum arabic,—to these ingredients a solution of tin may be added.

To make a solid or semi-solid soluble ink, which constitutes the fourth head of the invention, salts of iron, of alumine and potash, of copper and indigo, catechu and hæmatoxylon, are mixed together in the following proportions:—3 drachms of catechu, 1 drachm of hæmatoxylon, 10 grs. of acetate of deutoxide of copper, 1 scruple of sulphate of alumine, 1 drachm of gum arabic, 1 drachm of sulphate of iron, and a variable quantity of indigo, —all of these materials must be mixed in a state of powder, and a strong solution of campechy added. All the ingredients should be well amalgamated to make a thick paste, which must be dryed in the open air or in a gentle temperature; and when dry, the paste may be cut into squares, diamonds, or any other shape, like lozenges. This mixture is intended to make the solid soluble ink; but to make it semi-solid, it is necessary to add 1 drachm of uncrystalizable sugar or molasses, for the purpose of preventing it from becoming hard.

The fifth and last improvement is for a method of combining carbon with other colours and acids for the purpose of producing a really indelible ink. To accomplish this object, the following proportions and directions must be attended to:—Grind 24 lbs. of carbon (Frankfort black is used in preference to any other) with a mucilage formed of 20 lbs. of gum to 60 gallons of water, and after filtering it through a flannel, add 4 lbs. of oxalic acid and a variable quantity of cochineal and sulphate of indigo.

The claims set forth by the patentee are as follow:—First, using sulphate of indigo with gallic acid for the purpose of correcting the green and brown precipitates, such gallic acid being obtained in the manner above described, from sumac, catechu, elm wood, and other substances containing gallic acid or tannin, and which have not hitherto been so employed;

secondly, for the method described of acting on campechy wood by means of acetate or hydrate of deutoxyde of copper with sulphate of alumine, for the purpose of producing a beautiful purple colour; thirdly, using the oxalic acid, or bi-oxalate of potash with a solution of tin to dissolve Chinese blue or cyanoferruret of iron; fourthly, combining catechu, hæmatoxylon, and sulphate of indigo, to produce a solid or semi-solid ink; and fifthly, combining oxalic acid with carbon, cochineal, and sulphate of indigo, to produce an indelible black ink, which cannot be defaced by any known chemical agent. Ibid.

Specification of a patent granted to JULIAN SKRINE, *of Cambridge, for an invention of certain improvements in manufacturing forks, spoons, coins, and medals.*—[Sealed April 30th, 1839.]

The object of this invention is an economical and expeditious method of manufacturing spoons, forks, coins, and medals. The method of carrying the invention into effect, may be thus explained:—

Pieces of metal of something like the shape of the articles to be produced, are in a heated state, passed between two rollers, having a pattern or ornamental device cut or engraved upon their peripheries. These rollers are called the preparing rollers, and are intended to give the required thickness to the different parts of the article, and also to stamp or impress the shape of the pattern or device thereon preparatory to their being passed through the finishing rollers, which are another pair of rollers having the pattern or device cut or engraved thereon, and are intended to complete the formation of the pattern or device given by the first pair or preparing rollers. The articles in this state are removed to a pair of dies for the purpose of straightening or giving them the shape required for spoons and forks. The articles may then be polished and finished up in the ordinary manner.

Coins and medals are produced by forming or preparing them in the first pair of rollers, so as to give, as it were, the outline or shape of the device,—the pattern or ornament being finished by the second pair or finishing rollers.

The patentee claims producing the various articles above-mentioned, by means of rollers having the pattern, ornament, or device cut or engraved on their peripheries. Ibid.

Specification of a patent granted to RICHARD LAMB, *of Southwark, in the county of Surry, for his invention of improvements in apparatus for supplying atmospheric air in the production of light and heat.*—[Sealed 15th March, 1839.]

In order to keep up a regular and constant blast to a lamp or fire, a quantity of atmospheric air is forced by a pump or other mechanical means into a reservoir, furnished with a stop-cock to regulate the supply. The air is expressed from the reservoir by means of a weight or other convenient power, and is conveyed by a pipe to a lamp, fire-place, furnace, or other situation where a blast may be required. By this means a constant and undeviating supply of air is obtained, instead of the sudden puffs given by a bellows of the ordinary construction. Ibid.

Specification of a patent granted to WILLIAM COLCHESTER, *of Ipswich, in the county of Suffolk, for an improved soap frame.*—[Sealed 29th July, 1839.]

The frames, usually employed in the manufacture of soap, are made of wood, bound with iron, for the purpose of strength. Wood, however, being a very bad conductor of heat, it generally requires from six to eight days to allow the soap to become sufficiently cool to be removed from the frame. Instead of wood, therefore, the patentee employs stone, slate, or marble, which being good conductors of heat, the soap, in frames made of these substances, will cool in a much shorter time,—24 hours being generally found long enough for the soap to become hard. Although other materials are mentioned, the patentee prefers slabs of slate, properly held together by ties.

Ibid.

Progress of Practical and Theoretical Mechanics and Chemistry.

On the Galvanic Properties of the Metallic Elementary Bodies, with a description of a new Chemico-Mechanical Battery. By ALFRED SMEE, *Esq.*

Last May a number of experiments were performed upon the galvanic properties of the non-metallic elementary bodies, and these were attended with the acquisition of some curious information, but till lately no opportunity has presented itself of extending the series of investigations then conducted: now, however, that I believe that I can lay before the public a valuable battery, no time is lost, that others may extend and improve the new principle about to be detailed.

With regard to the metallic elementary bodies, their properties have been investigated so frequently, and to such an extent, that it may seem unnecessary to draw attention again to them; but two circumstances influencing their action have never been noticed. It is well known that the positive metal should be the most readily acted upon by the solution, and the negative the least, and the further these are apart, the more forcible will be the battery: thus, *cæteris paribus*, platina and zinc are more powerful than iron and zinc; but if a circuit be made of a piece of smooth platinum and zinc it will sometimes happen that the effect is less than when a circuit is formed by a similar piece of iron. Now this appears at first sight paradoxical, though it can in many instances be easily explained; for if the platinum be carefully examined, it will be seen that the acid solution does not really wet the platinum, but runs off from the greater part of the surface, as metallic mercury does from glass. In this state, a piece of platinum having a surface of thirty-two square inches, formed into a battery with amalgamated zinc and connected with a magnet, supported three-quarters of a pound through five thicknesses of paper; when the same piece of platinum was heated or dipped in nitric acid and afterwards well washed, it supported a similar weight through twelve thicknesses of paper, thus being less powerful than iron in the first instance, and more so in the second. In the same way, silver supported under the like circumstances, the keeper

of a magnet through three layers of paper: on being heated and again wetted, the attractive force was exerted through nine thicknesses of paper, but no additional power was gained by removing the surface of the silver by nitric acid. The metals in these cases appear to become coated with a film of air, which effectually prevents the contact of the fluid. This is also seen in the various forms of charcoal, which after ignition are very powerful, but lose much of their force if long exposed to the air; their energy however is restored upon their being again heated.

As in the experiments just detailed, and in those which I am about immediately to describe, the relative powers of the arrangements have to be considered, it will be proper to mention in what way the results were obtained. A soft iron horse-shoe magnet was suspended, round which covered wire in communication with the poles of the battery was wound: the keeper, which weighed three quarters of a pound, was separated from the poles of the magnet by as many layers of thin blotting paper as could be used without its falling; thus with a battery of feeble force few layers of paper could be interposed; but with one of greater strength, forty or sixty thicknesses might be used. A similar form of apparatus might easily be devised, which would show by means of a delicate screw the exact distance at which a given weight would be supported by the attractive force of the induced magnet.

The influence of different conditions of surfaces is a subject which has escaped all experimenters. Now this is singular, for many must have noticed, that in a circuit, the greatest quantity of gas is given off at the corners, edges, and points. Following this hint, a piece of spongy platinum, consisting as it does of an infinity of points, was placed in contact with amalgamated zinc, when a most violent action ensued, so that but little doubt could be entertained of its forming a very powerful battery. The fragile nature of this material precludes it from being thus used, and therefore it was determined that another piece of platinum should be coated with the finely-divided metal. This experiment was attended with a similar good result, and the energy of the metal thus coated was found to be surprising. To test the value of this process, a piece of platinum thus platinized, was placed in dilute acid in contact with amalgamated zinc, and the quantity of gas evolved in a given time was noticed.

Platinized platinum	7 sq. inches gave off	5	c. in.	per 1	minute.
Platinum heated	ditto	1	"	per 1	minute.
Platinum covered by air	ditto	1	"	per 6	minutes.
Platinized coke	small piece	3	"	per 5	minutes.
Plain coke	ditto	1	"	per 25	minutes.

In these experimentst he contact was made in each cell alike; the same zinc being used, and the distance being the same between the metals. The energy of the metal, thus prepared, upon the soft iron magnet is very great. A piece of platinum exposing thirty-two square inches of surface, supports three-quarters of a pound through seventeen thicknesses of paper, whilst when smooth and wetted it supported it through eleven layers; and when no care was taken about its being wet, but when simply plunged into the liquid, only through five layers of the same paper.

The cause of this increase of power appears to be the facility given to the evolution of the gas from the number of points, and not from an increase

of surface, as but little benefit attends its application in the nitric acid batteries, in which the hydrogen is not evolved, but absorbed by the fluid.

The next point which we have to consider, is whether other finely-divided metals have the same good effect; but no other of the many metals that I have tried can be used with similar good results, except palladium, which though it has not much effect in the sponge, is found when precipitated on platinum, or silver, to possess powers, about equal to the finely-divided platinum. Precipitated silver increases the power of the metals, but not nearly to the extent of platinum.

Having ascertained that a solution of platinum must be used for increasing the power of metals in their ordinary state, it becomes a matter of great importance to ascertain whether the platinum may be precipitated upon other metals with advantage; and for this purpose it was deposited upon earthenware, palladium, pure silver, copper plated with silver, nickel, German silver, tin, lead, brass, cast iron, sheet iron, steel, zinc, and charcoal. The platinized earthen ware was not found to answer, apparently from the quantity of the metal not being sufficient to carry the electricity. Palladium, silver, and plated silver answered equally well with platinum to receive the precipitated metal, and if there was any difference, I think the silver was rather the best. Plated copper answers very well, but care should be taken to varnish every copper edge, or else that metal is apt to be slightly dissolved, and deposited again upon the platinized silver, which is injurious. Should copper, from any cause, get upon the silver, it may be dissolved by a little muriatic acid, and afterwards by a little strong ammonia. No other metal or alloy besides this answered for the reception of the platinum, except iron, and this was as active as silver for a time, but then a local battery was formed between the platinum and iron—the iron was dissolved and the battery destroyed. In some cases this does not take place so rapidly as in others. Carbon answers admirably for the reception of the platinum, and is improved in like manner.

We have now the elements for the manufacture of a powerful battery; for we have seen that increase of power is obtained by taking care that the negative metal is thoroughly wetted by the fluid, and that this is not only accomplished, but its power materially increased by the numerous points formed by the precipitation of finely-divided platinum. Whatever metal, alloy, or compound may be found hereafter to succeed for the reception of the platinum, or whatever metal may be found to answer instead of the finely-divided platinum, still the principle by which the advantage is gained will be the same. However, the battery which I now propose is to be made of either copper plated with silver, silver, palladium, or platinum. The silver can be rolled to any thinness, and therefore is not expensive. Each piece of metal is to be placed in water, to which a little dilute sulphuric acid and nitro-muriate of platinum is to be added. A simple current is then to be formed by zinc placed in a porous tube with dilute acid; when, after the lapse of a short time, the metal will be coated with a fine black powder of metallic platinum. The trouble of this operation is most trifling; only requiring a little time after the arrangement of the apparatus, which takes even less than the description. The cost I find to be about 6*d.* a plate of 4 inches each way, or 32 square inches of surface. This finely-divided platinum does not adhere firmly to very smooth metals, but when they are rough is very lasting, and sticks so closely that it cannot be rubbed off. On this account, when either silver is employed, or copper coated with silver, the surface is to be made rough by brushing it over with a little strong nitric

acid, which gives it instantly a frosted appearance, and this, after being washed, is ready for the platinizing process.

With regard to the arrangement of the metal thus prepared great diversity exists; it may be arranged in the same way as an ordinary Wollaston's battery with advantage; a battery thus constructed possessing greater power than Professor Daniell's battery: 4 cells, containing 48 square inches in each cell, decomposed 7 cubic inches of mixed gas per five minutes, whilst four cells of Professor Daniell's, in which 65 square inches of copper were exposed in each cell, gave off only five cubic inches in the same time. However, in my battery thus arranged, the action dropped to 5 cubic inches in five minutes, but it resumed its power after the contact had been broken for a few seconds. This battery also possesses great heating powers, raising the temperature of a platinum or steel wire, 1 foot long and of a thickness similar to that used for ordinary bird-cages, to a heat that could not be borne by the finger.* Its magnetic power is not less astonishing, three cells supporting the keeper of a magnet through forty-five, two cells through thirty-two, and one cell through twenty thicknesses of paper. An electro-magnetic engine was made to rotate with great velocity, the combustion of the mercury at the breaking of contact being exceedingly brilliant.

A battery of this construction should be in every laboratory, to be used in most cases where a battery is wanted, and the slight labour attending its operation is scarcely worth mentioning. I have used one for 48 hours consecutively without the slightest alteration either of the fluid, or in the arrangement of the metals, and the diminution attending its operation appeared to arise from deficiency of acid, for it was instantly restored by a little strong sulphuric acid in each cell. Where the battery is required to possess the same power for a long period, it might be advisable to separate the metals by a porous earthenware vessel, or what answers the purpose equally well, by a thick paper-bag, the joinings of which must be effected by shell-lac dissolved in alcohol. By these means, the sulphate of zinc is retained on the zinc side of the battery. The use of porous tubes, however, appears from observation, as far as my battery is concerned, to be nearly superfluous, at any rate in most cases; for I find, that after a battery arranged as Wollaston's had been at work in the same fluid for forty-eight hours, it had no zinc deposited on the silver. It is worth remarking, that during the last 24 hours contact had not been broken for a single instant. Notwithstanding these experiments, however, it may be as well in an extensive battery to use porous plates.

The battery may be arranged like the pot batteries, but I should greatly prefer the troughs, such as are used for Wollaston's batteries, from the convenience of packing, and from a battery of the same surface requiring so small a space. A battery may be constructed to form a most powerful calorimotor. It may also be arranged as a circular disk battery. Or it may be made as a Cruickshank's, each cell being divided or not by a flat porous diaphragm. Whatever arrangement is adopted, the closer the zinc is brought to the platinized metal, the greater will be the power.

The generating fluid which is to be employed is water, with one-eighth of sulphuric acid by measure; and the zinc ought always to be amalgamated in the first instance, as that process will be found very economical from its

* A small pot battery of six cells fairly fused into globules two inches of iron wire, and the combustion of different metals was extremely brilliant, when the battery was in combination with a Bachoffner's apparatus.

stopping all local action, and the amalgamation will be found not to require repeating, because there is no fear of copper being thrown down on the zinc, which occasionally happens in the sulphate of copper batteries.

The battery thus constructed is the cheapest and least troublesome in action that has ever been proposed, and from the smallness of its bulk will be found very valuable to electro-magneticians. It is second in power only to the nitric acid batteries, the objections to which have been already noticed. For medical purposes, with a Bachoffner's apparatus, a battery composed of platinized silver two inches each way will be found sufficient.

To recapitulate the processes of the formation of a battery: first the platina, silver, or plated copper must be roughened, the two latter with nitric acid, and afterwards washed. The metal is next to be placed in an acid solution with a little nitro-muriate of platinum, which metal is to be thrown down by the formation of a simple galvanic circuit; and lastly, the platinized metal is to be formed with amalgamated zinc into a battery, either with a porous tube or paper-bag, or without them, according to the fancy of the operator, or the purpose for which it is wanted.

The advantage from this form of battery arises, as I believe, from a mechanical help to the evolution of the hydrogen; and therefore it is proposed to call it the Chemico-mechanical battery. This battery may remain in the acid for a length of time, and neither the amalgamated zinc nor platinized silver will undergo the slightest change, and the whole will be as silent as death. Let only communication be made, the liquid in each cell becomes troubled;—it boils—it bubbles, and produces the effects which have been detailed. The quantity of electricity passing through either wires or liquids may be pretty accurately judged from the action taking place in the battery, for if the communication be made through a liquid of difficult decomposition, or through long small wires (70 or 80 feet,) but little gas will be given off from the platanized metal, but when short thick wires are used the action is violent. A galvanometer might be constructed of one cell, similar to the oxygen cell of Professor Daniell, as this would show the exact amount of electricity passing.

The constructing a battery that shall be small in compass, efficient in action, cheap in its operation, and devoid of troublesome manipulation, is important in the highest degree; and I consider that my chemico-mechanical battery will be found frequently a useful means of obtaining gases for the oxy-hydrogen light. Its value for blowing up vessels under water, and exploding powder in mines, is sufficiently obvious.

In conducting the extensive series of experiments, of which this is a summary, the grand features have been rather attended to than very minute results; and in conclusion, it would ill befit me if I did not here mention the valuable assistance I have received by the loan of apparatus, &c. from many individulals, but most especially from professor Daniell, William Terry, Esq., and Mr. E. Hart Palmer. Lond. & Ed. Philos. Mag.

Experiments on Mechanical Exosmose. By Julius Jeffreys, *M. R. C. S. late of the Hon. East India Company's Bengal Medical Service.*

A class of vitrifiable mixtures may have a body chiefly aluminous; and one of these combined with a felspatic earth and a small proportion of iron

oxide, produced the ware which *yielded* the experiments. This ware underwent, from a dull red up to the time it was at a full white heat, a regular progressive contraction of its parts, by which time it had lost one fourth or one fifth in length. Commencing with pores so open that they would transmit water or gas with little resistance, it became at the heat of fused cast iron as close and dense in texture as glass; and when cooled, was equally impermeable by fluids under any pressure, exerted during any length of time.

Such a substance in its passage through every intermediate degree of density, from that at which all fluids were allowed to pass through it, to that at which they were all confined, might be expected to arrive at some one, at which it would detect any difference in the size of the molecules of two fluids pressing against it for passage, by detaining the one but transmitting the other.

The results were curious. Vessels formed of this composition thick enough to bear the pressure within, were filled with water, containing a small quantity of mineral alkali, and into which was condensed about twelve times its bulk of carbonic acid gas under a pressure of nearly eight atmospheres; their mouths being effectually secured so that no leakage whatever took place through them. The alkali varied from half a drachm to a drachm and a half of carbonate in twenty ounces. Such vessels as were in their most porous state, having been only hardened at a full red heat, allowed both the water and the gas to be ejected by the repulsive force through their pores, the liquid being projected in every direction in the form of a fine rain or cloud, until the pressure within was relieved.

Such vessels again as were in a properly effective condition, having been exposed to their maturing heat, retained their contents without any apparent loss for a year; and when placed near a fire would burst with a violent explosion, without allowing any exudation to take place.

A third kind of the same composition, apparently intermediate as to density between the two already noticed, allowed the gas alone to make its escape through the pores, rather quickly at first, but as the pressure lessened more gradually, until an equilibrium was nearly established, the whole or nearly the whole of the liquid being retained.

In a fourth kind a density was attained much above the last, but short of that of the entire impermeability of the second kind described, and this texture yielded results very curious in themselves, and especially so when contrasted with those last described. Here instead of the gas escaping, and the liquid being retained, the reverse took place. In process of time, varying from two to four months, every drop of the water was forced out, so that when the vessel was opened it was as dry within as when it came out of the furnace; yet the gas was retained highly condensed, and made its escape with a loud report.

On one occasion a violent explosion took place from a blow which I had reason to suppose would not have been sufficient to cause it, had alkaline solution been present to restrain the elasticity of the gas. In one case the outer surface of the ware was frosted over with the efflorescent alkaline carbonate, which had passed through it in a state of solution: the water was all gone, the vessel being as before perfectly dry within, yet the gas apparently all present.

The power that effected the transmission of the water and alkali being the elastic force of the gas, I could conceive it to act in no other way than mechanically, and to indicate, therefore, some difference in the size of the

elastic and the liquid molecules; the former being too large to find passage through the pores of this closer ware, while the latter, both aqueous and alkaline, all escaped. So far the gaseous were heterogeneous to the liquid particles; and the difference of size indicated might be supposed to depend upon a difference of their original magnitude, and not of magnitude arising from their liquid and gaseous condition. But it will be observed that the alkaline *carbonate* traveled out with the water. Here, therefore, was carbonic acid in a liquid state, forced out through apertures which refused exit to the same matter in the state of gas. By this it would appear that the atoms of matter are indeed invested, as has been supposed, with an ethereal atmosphere elastic in itself, but forcibly drawn around the atom, so that it can find passage only where there is space for its ether to accompany it, and that this ethereal investment being much larger around gaseous than around liquid particles, apertures through which the latter may be forced may nevertheless be too small for the passage of the former. It appears to me difficult otherwise to explain the phenomena of this experiment.

Again, in that case in which the reverse took place, namely, an exit of the *gas* and a retention of the *liquid*, and which was a result most persons would expect, inasmuch as it is commonly more easy to make vessels water-tight than air-tight, a sufficient explanation may be given which shall not be incompatible with the case just recorded, and which may remove the apparent incongruity of the two experiments. In this case, though the pores were free enough to give passage both to the water and to the gas, the density was still sufficient to detain the water during the time the gas kept extricating itself, and constantly occupying the pores of the ware to the exclusion from them of the water. Though the chief force, the mechanical one, acted upon both fluids, a little might turn the scale in favour of the relief taking place by a departure of the one and not of the other. Now quite enough to decide the point in favour of the exit of the gas, might be found in the well-established diffusive tendency of the gases shown in the phenomena of electric exosmose, by which the gas on the one hand would seek a departure into the atmosphere through the ware, while on the other hand the cohesion of the liquid particles would favor their remaining together within it. This process went on until the gas was nearly all discharged, the small remaining quantity being detained by the affinity of the alkali and the water.

In the instance of great porosity first noticed, the results explain themselves at once. Here there was not closeness of texture sufficient for even such a detention of the contents as would enable the gas and liquid to part, and the process of exosmose to remove the former; but both fluids were propelled through the pores, the water in fine rain which formed into a mist.

The familiar fact that water may be retained in a porous earthen pitcher for a length of time without any escaping except by evaporation, although the lower part is under the pressure of a foot or more of the fluid, while such a pressure would suffice to force air quickly through the pores, would commonly be explained by supposing a greater minuteness of parts in the case of air than of water; but the above experiments would prove the contrary. Ibid.

On Engraving by Voltaic Electricity. By Thomas Spencer.

In last week's *Athenæum* you made some remarks respecting my invention of engraving by voltaic electricity. I need scarcely say I feel much grati-

fied to know it is becoming generally useful, although I have had much more striking proofs of this than you seem to have yet seen. My object in now addressing you, is to lay before your readers some improvements I have recently made in the process, which, although apparently trifling in themselves, will be of immense importance in its future applicability. I am the more induced to do this through the medium of your journal, as I have a greater number of correspondents requesting information on the subject than I can readily answer, and finding most, or all of them, are your readers, this may suffice.

In my pamphlet, published last September, I gave some directions how to construct the necessary apparatus. I then recommended plaster of Paris as a medium to separate the cells. Since that time I have tried many other porous substances; but find that brown paper far exceeds everything else that I have hitherto used. The advantages derived from its use are, that it will allow a deposit to take place in one-half the time that would be occupied in depositing a given thickness by the use of plaster of Paris—the metal deposited being of a very superior character; and the whole operation proceeds with a degree of regularity I have not experienced in the use of anything else. The paper I use is not the brown paper usually sold by stationers, but a thicker sort, manufactured, I apprehend, by the paper-makers to inclose their parcels in. I fasten it to the interior cell of the apparatus by melted pitch, or the common resinous cement used by philosophical instrument makers. The zinc in the interior cell should rest at $\frac{1}{8}$th of an inch distance from the brown paper, and the plate to be deposited on should be kept at about $\frac{3}{8}$ths or $\frac{1}{4}$ths of an inch from the opposing paper surface in the exterior cell.

I also previously recommended a cement of which those portions of a plate *not* to be deposited on, were to have a coating; I now find, however, that common bees-wax, melted by heating the plate, entirely prevents deposition on those parts to which it is applied. Every thing hitherto used by me allowed partial deposition to take place. If the solution can be kept at a temperature of 80 or 90° Fahrenheit, the process is accelerated—this is much better than quickening it by the addition of the salt used to excite the positive cell.

A writer in the *Philosophical Magazine* recommends that the plates might be more conveniently suspended by being placed in the apparatus vertically. A little experience, however, will prove this to be a disadvantage; as, in such cases, the deposition at the lower end will greatly exceed that at the top, consequently rendering the plates very much thicker at one end than the other, which is to be avoided.

In a previous number of the same journal, Prof. Jacobi recommends that a galvanometer be always placed in connexion with the apparatus. This is sheer absurdity, tending needlessly to complicate, without affording the slightest clue to what is taking place in the cells—it pointing out the development of feeble quantity, not intensity; and the slightest variation in the size of the plates, or their distance from each other, would give contrary results.

I am now occupied in some experiments which may terminate in still greater improvements in the economical use of this principle. While I write I have before me a small electro-magnetic rotary machine in rapid motion. In connexion with it there is a helix, or coil, of covered copper wire, consisting of two lengths, each 400 feet, the thicker one transmitting the primary current, the smaller the induced current. In connexion with one

end of the primary wire I have placed a copper plate to be copied—to the opposite end of the same wire I have connected a spiral of *copper wire*, which is immersed in a porous cell containing dilute sulphuric acid, with a few drops of nitric acid, the plate to be copied being immersed in sulphate of copper: the electric action excited by this arrangement being sufficient to revolve the magnetic machine—*while, at the same time, it is depositing* pure copper on the plate to be copied, in one cell, and *producing* sulphate of copper by the dissolution of the copper wire in the other. To each end of the smaller wire transmitting the induced current, I have also attached a similar arrangement—viz. a plate to be copied, and a piece of spiral wire, in a pair of separate cells. This arrangement *is also* depositing copper on the plate to be copied. My object in this was to take advantage of the increased amount of electric action always acquired by transmitting the current through spiral coils, and also to avail myself of the induced current, which is always eliminated in an opposite direction to the primary. This latter current is generated at absolutely *no* expenditure of material. For the mere purpose of depositing copper, I might have used the helix without the rotary magnet; but my object was to ascertain the practicability of *employing* the electricity generated by the process for other uses. From this experiment I can give my opinion without hesitation, that should electro-magnetic engines be brought into practical use, of which I entertain no doubt, the same battery that excites them into action on the one hand, will, on the other copy engravings of any size, *ad infinitum*. For, after all we have heard lately of voltaic batteries of intense power, sustaining ones, slow but equable, are the only apparatus that can be depended on for an indefinite length of time. I have not yet made experiments with the helix in sufficient number to warrant me in stating, for the present, the increase of deposition that may be derived from its use. I intend trying a number of statical experiments with coils of different thickness, and also coils of flat copper rolled up in the form of ribbon, covered with silk. The results of these may form the subject of another communication.

Liverpool, April 14. Athenæum.

New Voltaic Battery.

A few evenings ago, a Voltaic Battery, upon a new and improved construction, was exhibited at a meeting of the Members of the Society of Arts, and gave great satisfaction. It is the invention of Alfred Smee, Esq. and constructed by Mr. Palmer, of Newgate street.

The inventor calls it a "Chemico Mechanical Battery," and the peculiarity of construction consists in coating the negative plate with a layer of finely divided platinum, which not only insures perfect contact with the exciting liquid, but from the immense number of points which it presents, causes the most violent and intense action, which however ceases immediately the circuit becomes broken. It excited very great interest, and is well worthy the attention of gentlemen interested in this branch of science.

The advantages of this new battery are so very great, that it must, we should imagine, supersede all other constructions at present known. Instead of the trouble and inconvenience arising from the use of solutions of sulphate of copper and muriate of soda, as in the batteries now in use, it requires only one sort of exciting liquid, and that of the cheapest and cleanest kind, namely,—dilute sulphuric acid, mixed in the proportions of

one part by weight of acid to eight of water; the battery does not require any trouble to keep in order, for when the apparatus is done with, it only requires to be taken out of the liquid, and is always ready for use, at any period, however distant. Through the kindness of Mr. Palmer, we have had an opportunity of witnessing the surprising effects of this battery.—It consists of 24 pairs of small plates, and an earthenware trough for holding the acid solution. Platinum wire, the least fusible of metals, is not only heated to a white heat, but completely and instantaneously fused. Iron wire, of considerable substance, is also instantly melted, and falls down in globules; but the most brilliant effects are produced by connecting the battery to an electro magnetic apparatus, when the combustion of different metals resembles a display of fire-works.

Upon connecting two pieces of coke, or charcoal, one to the positive and the other to the negative end of the battery, and bringing them into contact, a light nearly if not quite equal in intensity to the oxy-hydrogen light, is produced.

A great advantage to be derived from the use of this battery, is its economy, as after the first outlay incurred in purchasing the article, the cost of setting it in full action is not worth attention; the only exciting liquid being, as before mentioned, diluted sulphuric acid; and from the greater degree of power exerted by this battery, it will not be necessary, under ordinary circumstances, to have so large a one as must be employed for similar purposes, if one constructed in the ordinary manner be used.

We are informed, that a small one, consisting of only one pair of plates, and which may be used in a common drinking tumbler, will be found sufficient for general medical purposes, and for connexion with an electro magnetic apparatus.—The cost of such battery would not exceed ten shillings.

Lond. Jour. Arts & Sci.

Sawn Slate Pavement.

Experiments have been made to ascertain the applicability of slate to other uses than the covering of houses. The result has been the discovery that, as a material for paving the floors of warehouses, barns, &c., where great strength and durability are required, it is far superior to any known material. In the extensive warehouses of the London Docks it has been used on a large scale. The stones forming several of the old floors having become broken and decayed, have been replaced with slate two inches thick; and one wooden floor, which otherwise must have been relaid, has been cased with slate one inch thick, and the whole have been found to answer very completely. The trucks used in removing the heaviest weights are worked with fewer hands. The slabs being sawn, and cemented closely together as they are laid down, unite so perfectly that the molasses, oil, turpentine, or other commodity which is spilt upon the floor, is all saved; and as slate is non-absorbent, it is so easily cleaned, and dries so soon, that a floor upon which sugar in a moist condition has been placed, may be ready for the reception of the most delicate goods in a few hours. Wagons, or carts, containing four or five tons of goods, pass over truck-ways of two-inch slate without making the slightest impression. In no one instance has it been found that a floor made of sawn slate has given way; in point of durability, therefore, it may be considered superior to every other commodity applied to such uses. The consequences of this discovery have been, that full em-

ployment is found in the quarries which produce the slate, and that additional employment has been given to the British shipping engaged in the coasting trade. Mining Journal.

Voltaic Reaction.

A Lecture was given by Mr. Grove on voltaic reaction, or the phenomena usually called polarization.

Mr. Grove detailed the first experiments of Volta, Erman, Ritter, and Davy, the more recent ones of De la Rive, the explanation of these by Becquerel, and the confirmation of this latter philosopher's opinion by the experiments of Dr. Schœnbein, Mr. Matteucci, and Mr. Grove himself; all which, as well as the experiments of Mr. Grove on the inactivity of amalgamated zinc, which he proved to be due to the same order of causes, have been already given in full in various numbers of the Philosophical Magazine. All the effects which have generally been included under the term polarization were proved by Mr. Grove to be traceable to one principle, viz. the electrolytic transfer of elements having for each other a chemical affinity, and the reaction caused by this affinity when the decomposing and transferring power, i. e. the initial voltaic current, is arrested. What we are most anxious to call the attention of our readers to, are the astonishing effects exhibited by Mr. Grove at the conclusion of his lecture. Two batteries, little differing in construction from that described by him in the Lond. and Edinb. Phil. Mag., were charged some time previously to the lecture, and up to the period of its conclusion remained in perfect inactivity until the circuit was completed. One of these was arranged as a series of five plates, and contained altogether about four square feet of platina foil; with this the mixed gases were liberated from water at the surprising rate of one hundred and ten cubic inches per minute. A sheet of platinum, one inch wide by twelve long, was heated in the open air through its whole extent, and the usual class of effects produced in corresponding proportion. With the other arrangement, consisting of fifty plates of two inches by four, arranged in single series, a voluminous flame of one inch and a quarter long was exhibited by charcoal points, which showed beautifully the magnetic properties of the voltaic arc, as Dr. Faraday held a piece of iron near it, being attracted and repelled by different portions of the iron: bars of different metals were instantly run into globules and dissipated in oxide. It should be borne in mind that all these effects were produced by a battery which did not cover a space of sixteen inches square, and was only four inches high, and which had been charged for some hours.

Mr. Grove adverted to the letter of Prof. Jacobi to Dr. Faraday published in the Lond. and Edinb. Phil. Mag., vol. xv. p. 161, and stated that Mr. Pattison, who navigated the Neva with Prof. Jacobi in October last, had observed that the batteries employed were on Mr. Grove's construction, which the Prof. without hesitation admitted. Lond. & Ed. Phil Mag,

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Gilbert's improved Gas Stove.

At the Bath Instruction Society last week, the Principal, Edward Osler, Esq., late of Falmouth, delivered a lecture to the Associates on the different methods of warming and ventilating buildings, in the course of which he called their attention to a gas stove, on a new and improved principle, which has just been fixed in the school-room of the City Commercial School.

The common gas stove is merely a covered cylinder of iron, containing a hollow ring communicating with the gas pipe, and pierced with minute holes, from which the gas burns in small jets. The products of the combustion, mixed with a portion of gas, (for the gas is never wholly consumed when burnt in a jet) are discharged into the room, the air of which is thus rendered very unpleasant, and even unwholesome; hence the use of these stoves is confined to halls and shops where there is a very free ventilation. In the improved gas stoves these evils are entirely avoided. The gas is first mixed with a sufficient portion of atmospheric air to ensure its complete combustion and then passes through a plate of wire gause, on the surface of which it burns with a flickering blue flame. The combustion takes place within an oblong iron box, which is thus heated sufficiently to diffuse a soft and equable warmth through the apartment. A pipe carries off the vapour into the chimney. No inconvenience or risk whatever is connected with the use of the stoves, and the fire can be lighted or extinguished with the same facility as a common burner. This consideration, with the perfect freedom from dust and the avoiding of all trouble in keeping up the fire, makes the stove particularly desirable for a school-room. It also promises to afford an easy, cheap, and effectual means of warming a conservatory or hot-house; and it may be conveniently introduced into dwellings, for in addition to its use in warming the apartments, it may be employed, to a considerable extent, for cooking. The stove fixed in the Bath City School was made by the inventor, Mr. Edward Gilbert, Civil Engineer, &c. of Falmouth, and was exhibited last month at the annual exhibition of the Royal Polytechnic Society of Cornwall. Any person wishing to see it may be gratified by calling at the school-room. Bath Chronicle.

New Alloys of Metals.

A curious and valuable discovery has just been made in the alloy of metals. A manufacturer of Paris has invented a composition, much less oxidable than silver, and which will not melt at less than a heat treble that which silver will bear; the cost of it is less than 4*d.* an ounce. Another improvement is in steel; an Englishman at Brussels has discovered a mode of casting iron so that it flows from the furnace pure steel, better than the best cast-steel in England, and almost equal to that which has undergone the process of beating. The cost of this steel is only a farthing per pound greater than that of cast iron. Mining Jour.

Progress of Civil Engineering.

Habitudes of Iron. Asiatic Society. March 7.

H. Wilkinson, Esq., said, that he was about to read a paper on Iron: a subject which did not appear to have much connexion with the Society's pursuits; but when he stated that India could produce a metal equal in quality to the best iron from Sweden, and at a cost, when landed in England, of 60 per cent. under Swedish iron, he thought that anything on the subject would be received with interest. He said that Mr. Heath had received some hundreds of tons of ore from India, and he expected as much more, which contained 72 per cent. of pure metal; and from this ore excellent

wrought iron could be made at once. He had been performing some experiments on this iron in conjunction with Mr. Heath; and had made sword blades of the steel produced from it, which excelled any he had ever seen. Mr. Wilkinson said, that what he was going to read would not be absolutely new, though probably it might be to several gentlemen present. It was upon the spontaneous heating of cast iron when brought into the air after it had been for many years under salt water. Several instances of this action were stated; the most curious of which was that of some cannon balls, raised in June, 1836, by means of the diving apparatus, from the ship *Mary Rose*, which sunk in a naval engagement near the Isle of Wight, in July, 1545, nearly 300 years before. These balls all became hot on exposure to the air, and fell to pieces. It was observed, also, that they had all lost about 36 per cent. of their weight. An iron ring, from one of the guns, was placed upon the table; being of wrought iron, it had not exhibited the phenomena shown by the cast iron, and was merely oxidized. Mr. Wilkinson stated, the cast iron grating which had been long immersed in the porter vats in the large breweries of London, grew hot, when the porter was drawn off, and from a similar cause. He then alluded to the cast iron protectors which had been fixed to the copper bottoms of ships, so as to prevent their corrosion by salt water, in pursuance of a suggestion by Sir Humphrey Davy, and observed, that in this case the action of the salt water on the iron was greatly aided by the galvanic action caused by the contact of the two metals. The iron lost half its weight in two or three years, although retaining its original form; and in one large piece, which he produced, the weight was reduced almost to the levity of a piece of cork; and this piece would make a mark on paper like a lump of black lead. The cause of the action in all these cases was, the minute quantity of carbonic acid gas held in solution by the water, it being taken up with the atmospheric air, which was always found to contain about 1 per cent. of this gas. This acid was the cause of rust, which he proved by exhibiting two bottles, one containing iron in ordinary water, the other, iron in water deprived of its carbonic acid gas. In this bottle the iron was perfectly bright, notwithstanding it had been two years immersed; while in the other bottle the metal was covered with rust. These facts gave a clue to the cause of the curious phenomenon first mentioned. It was well known to chemists that several metals, when reduced to a minute state of division, caught fire spontaneously by the absorption of oxygen. Cast iron, which had been long exposed to the action of salt water, was in this state: it was, in fact, almost all carbon; and the little metal that remained, being diffused throughout the mass, was, necessarily, very minutely divided; on exposure to the air, an absorption of oxygen took place, and great heat was evolved. The subject might be illustrated by enclosing tartrate of lead in a glass tube, driving off the acid at a red heat, and then hermetically sealing the tube. The enclosed substance would be a black powder, consisting of lead minutely divided, combined with a small portion of carbon. This, if well made, would keep good for months; and on breaking the tube would instantly take fire. Mr. Wilkinson observed, that it was difficult to hit the mark correctly in this experiment, for the least access of heat agglutinated the lead, while, unless a certain degree was kept up, no lead would be reduced to the metallic state; and, in either case, spontaneous combustion would not follow. He had brought three or four tubes with him for exhibition; but had no great confidence that he should succeed in firing them. The tubes were broken, but the substance did not take fire: it appeared that the metal had not been suf-

ficiently reduced. Mr. Wilkinson therefore applied a small addition of heat, and the powder instantly inflamed on being shaken from the tube, and brought in contact with the air. Athenæum.

Burning Coal Mines.

In our last number we gave extracts from letters received of the progressive conflagration of the coal mines in the department of the Allier, which, since the year 1816, had not been subjected to so direful a result as that embodied in the following description, extracted from the *Athenæum*. The late accounts, however, state that considerable progress was being made in turning the waters of the river Gange into the workings, and thus stopping the progress of destruction. The loss, however, must, in any case, be considerable:—

"Letters and papers from the department of the Allier, bring accounts of a remarkable conflagration which lately broke out in the coal mines of Commentry, and had been burning for a week with daily increasing fury. It appears that this fire, which, for the last twenty-four years, has been silently smouldering in the bowels of the earth—revealing its existence by perpetual smoke, and occasional outbreaks of flame, which, however, had always been confined within the limits abandoned to its dominion—had, at length made its way through some breach into one of the vast galleries of these extensive workings; and there, meeting with the air-current so long denied it, had spread through all the subterranean chambers and passages with a rapidity before which resistance became utterly powerless, showing itself at every crevice and outlet of the vast labyrinth, and flinging its points and columns of fire far up into the air, through all the shafts that led into the wide field of the rich deposit. Luckily the solemnities of the day, it being Sunday, had emptied the workings of their human tenants, for no mortal aid could have availed them against the suddenness with which the fiery flood swept over all things. The authorities of the district were early on the spot, but have hitherto been little more than idle and awe-struck spectators. Neither Vesuvius, nor any other eruption, say the accounts, can give a notion of the dreadful and sublime scene. 'If,' says one writer, 'it were possible to forget that the flames have been, for three whole days, devouring immense wealth, and that by this conflagration 300 fathers of families will be thrown out of employment, there would be room for no other sentiment than that of admiration at the magnificent spectacle. Imagine a deep ravine, nearly circular, in the form of a reversed cone, with its edges, however, hourly enlarging. Through fourteen large openings, issuing at about twenty feet above the ground of this ravine, and giving access to the innumerable galleries of the mines below, as many torrents of flame are poured forth, with frightful violence from the cauldrons within—flames of a thousand hues rushing forth like fiery whirlwinds—dividing, and crossing, and mingling and rising, and falling, and rising again! At times, a hollow cracking sound echoes through the abyss; this is some huge block of coal detaching itself from the roof or sides of one of the galleries, and falling into the blazing gulf. Then rises up a thick column of black dust, till it reaches the openings of the galleries, where, pierced in all directions by the flames, long serpents of fire work through its volume from side to side.—Sixty feet higher up, on each side of the galleries, two gaping mouths shoot into the air their dazzling columns of fire. Suddenly one of these ceases.

It seems for a moment as if checked in its wrath. Then comes a long and startling groan from the entrails of the earth; and forth again rushes the flame, blood-red, roaring and terrible, threatening in its fury to lift up the burning mountain altogether, and bury the spectators beneath its dreadful ruins. Again, look around you; it is midnight, and 2000 human faces are there, some grouped on the opposite crest of the ravine, and some sheltered in the cavities of the rocks. Yet no sound meets the ear, save that of the roaring flames.' The latest accounts state that the rafters of the galleries had all fallen, and the founts of flame nearly ceased to play. The whole had become one huge burning gulf. The loss is said to be incalculable; millions of hectolitres of coal had been consumed. The engineers were preparing to turn the course of a stream, which flows at a league's distance, and direct it upon the burning mountain. Workmen were employed night and day in the operation, by which it was hoped to lay the mines under water."

A later account states "that the river flowed 38 metres beneath the coal-field. A minute survey of the ground was, however, made, and established the possibility of turning the course of a tributary stream, which flowed at a distance of 4,300 metres. The work was instantly commenced; the ground-formations for the bed of the deviation occupied 48 hours; and twice that interval of time sufficed to execute and arrange in their places certain wooden conduits, destined to traverse several intervening hollows. At length the waters so impatiently expected arrived, pouring into the burning mine 2,000 cubic metres of water per day. At the present moment, all the subterranean works are under water; and since the commencement of this month a system of irrigation has been established on the burning mass, which has produced the happiest effects. Hopes are entertained that, in time, not only will the immediate conflagration be extinguished, but that also which has been in operation for 24 years past." Mining Jour.

A New and Effectual Method to Kyanise Timber.

Within the last two or three weeks the Manchester and Birmingham Railway Company have commenced Kyanising their wood sleepers in a much more quick and effectual manner than by the old mode of simply depositing the timber immersed in the prepared liquid. The company have had made a large iron cylindrical vessel, weighing about ten tons, and which is about thirty feet long, and six or seven feet diameter, made from wrought iron plates, five-eighths thick, and double riveted, which vessel is capable of resisting a pressure of 250 lbs. on the inch. The vessel being filled as compactly as possible with wood sleepers, twelve inches broad and seven inches thick, the liquid is then forced in with one of Bramah's hydraulic pumps, and worked by six men to a pressure of 170 lbs. on the inch. By this means the timber is completely saturated throughout in about ten hours, which operation, on the old system, took some months to effect.

Observer.

Mechanics' Register.

Expanding Mandrel.

The Society of Arts have awarded their large silver medal to Mr. J. Hick, jun., of Bolton, for an improved expanding mandrel for turning lathes.

It is necessary that a mandrel should fit so accurately, as to bite on the inner surface with a force sufficient to counteract that of the tool, and, in the ordinary mode, the same mandrel cannot be used for two pieces which are of different diameters. Consequently, in many engineering establishments, a stock of mandrels is kept, amounting to 600 or 700. Mr. Hick purposes to do the same work with eight sizes of the mandrel, from one inch and a quarter to ten inches. He effects his object by having the spindle of the mandrel shaped on the frustrum of a cone, on the face of which are four dove-tail grooves to receive wedges, the under faces of which have the reverse inclination of the cone, so that the lines of their outside faces are always parallel with the axes of the mandrel. A nut is screwed on the spindle, which acts on the wedges through the medium of a conical cup, which drives them up to their bearings inside of the work. Mech. Mag.

Manchester and Liverpool Plate Glass Company.

A general meeting of the shareholders of this company was held on Friday, the 28th ult., at the works, Sutton, near St. Helen's. These extensive works are now in full operation, and the shareholders were gratified by viewing the various processes of the manufacture. Six large plates of glass were cast in a surprisingly short space of time, and, apparently, with great skill; indeed, the competition of the new and old companies seems likely to lead to considerable improvements in the production of this beautiful commodity. Upon this occasion, amongst a great number of very large plates of glass, there was shown one plate of a size that, we understand, has been rarely equalled in this or any other country; it was thirteen feet long by eight feet wide, and apparently free from imperfections.

Mining Journal.

Railways—Important Invention.

We copy the following paragraph from the *Sheffield Iris*, and, at the request of a correspondent, append a letter which has since been addressed to the editor of that paper, having reference to the invention.

"We understand there will be placed upon this railway, in a few days, an engine patented by a gentleman of this town, which possesses many advantages over any other. All the six wheels are connected by a strap either of hemp or leather, thereby presenting six points of adhesion or friction to the rails, instead of two, which will secure a uniformity of speed in all weather. It is expected to move double the weight, at the same velocity, to any other engine of same weight and capacity of cylinder. It will also greatly diminish the expenses of repairing the road; for each of the engines now in use weighs, when the boiler is charged with water, twelve tons, nearly the whole of which to ensure progressive motion, is placed upon the two driving wheels. But the patent engine having the weight divided equally between each wheel (every one being a driver,) it is obvious that the one engine is striking the rail with a twelve ton hammer, while the other is gently tapping it with four. Not only great speed, but great regularity also, are expected from railways, both of which will be insured by this invention. It will also acquire its speed, and be stopped, sooner than the other engine."

Ibid.

Railways in England.

There are now in England 682½ miles of railway completed and in operation, and it is expected that in the course of the present year 630½ miles additional will be completed, making altogether 1313 miles of railway, which will be brought into operation before the end of 1840. There will then remain for subsequent completion in England 413 miles, the entire number of miles for which railway Acts have been passed being 1726 miles. The amount to be raised by calls for railway purposes during the present year is calculated to be 5,908,500*l*., a sum considerably less than was called up during the past year of depression and suffering. The amount remaining to be called for, after 1840, is 3,865,000*l*., which will complete the capital authorised to be raised for railways in England by Acts of Parliament passed up to the close of last session. Ib.

The "Archimedes."

We have of late heard frequent inquiries made respecting the important substitution of the screw for paddles, exhibited in the *Archimedes*, of which we gave an account several months ago. The vessel is now at Dover, competing, in an amicable way, with the Government packets at that station, in which she has been very successful. The saving of fuel by this invention is a matter of great importance, and we understand that in all the trials, the screw has never once been out of order. The *Archimedes*, it is said, would have made any difficult passage, such as that from Liverpool to Dublin, during the winter, in as little or less time than the best steamer upon the station, and with half the fuel, because she would have often gone quicker by sailing than others by steaming. She is stiff under canvass, and sails beautifully—the screw being no impediment. The inactivity of the company for so many months was occasioned by the repeated accidents to the engine, and not by any difficulties about the invention itself. Ib.

Wealth in Russia.

M. de Tiszkiewicz, the richest landholder in Russian Lithuania, died a short time since. The St. Petersburgh papers inform us that he left to his three sons 2,000 villages, containing more than 60,000 serfs, and in ready money 10,000,000 crowns, and that it was this gentleman who was said to have refused the hand of his daughter to Duke Alexander of Wurtemberg, who afterwards married the Princess Marie d'Orleans. His daughter has since married Prince Sapicha, and had 2,000,000 of crowns for her dowry. A letter from St. Petersburgh says—"This gentleman's property comprised 46 extensive domains, on which there are 20,000 families of peasantry, reckoning in them 60,000 males. In money he possessed 56,000,000 Polish florins, equal in French money to 21,600,000 francs. He had had six children, of whom three sons, besides his daughter, survive him. The eldest, according to the laws of Lithuania, inherits the whole of this immense wealth. He, however, has assigned one-fourth to be equally divided between his two brothers. Galignani's Messenger.

LUNAR OCCULTATIONS FOR PHILADELPHIA, SEPTEMBER, 1840.

Angles reckoned to the right or westward round the circle, asseen in an inverting telescope. ☞ For direct vision add 180° ☜

Day.	H'r.	Min.	Star's name.	Mag.	From Moon's North point.	From Moon's Vertex.
8	13	48	Im. 2 Capricorni,	5	145°	187°
8	14	50	Em.		281	326
9	13	41	Im. e Aquarii,	6	129	165
9	14	50	Em.		303	347
11	15	53	Im. 21 Piscium,	6	67	111
11	16	28	Em.		359	46
20	14	34	Im. s Cancri,	6	1	308
20	14	46	Em.		337	284

Meteorological Observations for April, 1840.

Moon.	Days	Therm. Sun rise.	Therm. 2 P.M.	Barometer. Sun rise.	Barometer. 2 P.M.	Wind. Direction	Wind. Force.	Water fallen in rain.	State of the weather, and Remarks.
				Inch's	Inch's			Inches.	
⊗	1	38	56	29.85	29.90	S E.	Calm.		Cloudy—do.
	2	31	52	30.10	30.10	W.	Moderate.		Clear—do.
	3	31	62	29.90	29.90	S W.	do.		Clear—do.
	4	46	62	.50	.55	W.	Brisk.		Clear—flying clouds.
	5	40	58	.85	.87	W.	do.		Partially cloudy—clear.
	6	46	52	30.05	30.05	N W.	Moderate.		Cloudy—do.
	7	33	47	.10	.20	N.W.	do.		Clear—do.
	8	30	50	.20	.20	E.	do.		Clear—flying clouds.
☾	9	29	56	.24	.23	E.	do.		Clear—do.
	10	41	60	.25	.25	S.W.	Brisk.		Cloudy—clear.
	11	45	74	.10	.05	S E	Moderate.		Clear—flying clouds.
	12	54	66	29.85	29.75	S.W.	do.	3.40	Rain—thunder shower.
	13	44	54	.76	30 15	N.W.	Brisk.		Clear—do.
	14	40	60	30.30	.10	S E.	Moderate.		Clear—cloudy.
	15	47	62	29.95	29.95	W.	do.		Cloudy—do.
☉	16	50	71	.95	.99	S.E.	do.		Clear—hazy.
	17	48	72	.95	.95	S.W.	Brisk.		Clear—do.
	18	56	77	.80	.75	S.	do.		Clear—do.
	19	50	64	.90	30.00	N.W.	Moderate.		Cloudy—clear.
	20	42	64	30.10	.10	W.	Brisk.		Clear—do.
	21	37	60	.23	.25	E.	Moderate.		Clear—do.
	22	41	56	.23	.09	S.E.	do.		Cloudy—do.
☽	23	60	83	29.75	29.75	S.W.	Brisk.		Flying clouds—clear.
	24	63	79	.75	.80	W.	Moderate.		Partially cloudy—do. do.
	25	60	79	.90	.83	E.	do.		Fog—lightly cloudy.
	26	60	84	.80	.80	E W.	Brisk.	.25	Fog—clear—thunder shower.
	27	44	56	.85	30.10	N W.	Blustering		Clear—do.
	28	43	61	30.33	.35	E.	Moderate.		Lightly cloudy.—do. do.
	29	54	58	.05	29.90	E.	do.	2.20	Rain—do.
	30	56	71	29.65	.73	W.	do.		Clear—do.
	Mean	45.30	64.63	29.97	29.98			5.85	

	Thermometer.		Barometer.	
Maximum height during the month.	84.00	on 26th.	30.35 on the 28th.	
Minimum " "	29.00	on 9th.	29.50 " 4th.	
Mean	54.965		29.975	

METEOROLOGICAL REPORT

FOR THE STATE OF PENNSYLVANIA,

Collated from returns made to the Committee on Meteorology of the Franklin Institute of the State of Pennsylvania, for

JULY, 1840.

	County.	Town.	Observer.	Thermometer.										Barome			
				7, A. M.	2, P. M.	9, P. M.	Maximum.	Minimum.	Mean.	Days omitted.	Register. Lowest.	Register. Mean.	Register. Days omitted.	7, A. M.	2, P. M.	9, P. M.	Maximum.
1	Philadelphia,	Philadelphia,	J. M. Hamilton,	74.86	79.27	73.83	88.00	66.00	75.89	1	58.00	67.14	9	30.11	30.14	30.13	30.42
2	Montgomery,																
3	Bucks,	Newtown,	L. H. Parsons,	73.10	80.20	67.10	88.00	59.00	73.47	1/3	50.00	59.50	.	30.04	30.02	30.02	30.24
4	Lehigh,																
5	Northampton,	Easton,	Charles Elliot,	67.50	76.83	69.10	88.00	60.00	71.14	1 1/3	....	....	.	29.97	29.96	29.95	30.18
6	Monroe,	Stroudsburg,	A. M. Stokes,	73.96	81.89	70.00	90.00	52.00	75.28	12	....	....	.	29.59	29.62	29.58	29.80
7	Pike,	Milford,	Ralph Bull,	60.19	78.87	65.45	87.00	46.00	68.17	.	46.00	58.55	.	29.60	29.60	29.60	29.84
8	Wayne,	Honesdale,	W. Richardson,	63.64	81.64	63.85	89.00	52.00	69.71	17	50.00	56.12	23	28.89	28.91	28.89	29.05
9	Susquehanna,	Silver Lake,	E. Rose,	66.94	78.06	68.39	94.00	58.00	71.13	.	44.00	59.00	.	28.12	28.12	28.12	28.35
10	Luzerne,	Wilkesbarre,	W. F. Dennis,														
11	Schuylkill,																
12	Berks,	Reading,	C. F. Egelmann,	71.82	77.29	68.50	86.00	56.00	72.54	3	...	...	.	29.92	29.89	29.88	30.10
13	Chester,																
14	Delaware,	Haverford,	Haverford School,	71.81	79.31	71.66	88.00	59.00	74.26	1 1/3	58.00	66.00	1	29.57	29.56	29.57	29.80
15	Lancaster,	Lancaster,	Conservatory of Arts,	69.63	81.98	71.13	92.50	60.00	74.25	2/3	54.00	65.79	.	29.57	29.56	29.56	29.79
16	York,																
17	Lebanon,																
18	Dauphin,	Harrisburg,	J. Heisely,	73.20	81.27	77.55	90.00	63.00	77.34	1	59.00	68.60	1	29.78	29.79	29.79	29.97
19	Northumberland,	Northumberland,	Andrew C. Huston,	70.10	78.95	72.02	89.00	63.00	73.69	2 2/3	46.00	58.62	2	29.52	29.50	29.49	29.75
20	Columbia,	Danville,	C. H. Frick.														
21	Bradford,																
22	Tioga,																
23	Lycoming,																
24	Union,																
25	Mifflin,																
26	Juniata,	Mifflintown,	J. A. Rinkead,	62.40	81.30	67.38	90.00	51.00	70.36	3 1/3	....	....	.	29.54	29.48	29.52	29.73
27	Perry,																
28	Cumberland,	Carlisle,	Prof. W. H. Allen,														
29	Adams,	Gettysburg,	Prof. M. Jacobs,	68.13	82.26	71.25	94.00	53.75	73.88	.	50.00	61.64	.	29.45	29.44	29.44	29.65
30	Franklin,																
31	Huntingdon,	Huntingdon,	Jacob Miller,	68.00	83.13	70.77	90.00	58.00	73.97	2/3	....	....	.	29.43	29.40	29.40	29.62
32	Centre,	Bellefonte,	John Harris,	66.31	83.11	68.80	90.00	51.00	72.74	7 2/3	....	....	.	29.33	29.32	29.30	29.50
33	Potter,																
34	M'Kean,	Smithport,	Richard Chadwick,	61.48	79.81	60.03	93.00	42.00	67.11	.	59.00	53.77	.	28.07	28.08	28.07	28.28
35	Clearfield,																
36	Cambria,	Ebensburgh,	Richard Lewis,	62.21	78.52	63.87	89.00	52.00	68.20	3 1/3	44.00	55.59	4	28.00	27.99	27.98	28.22
37	Bedford,	Bedford,	Samuel Brown,	71.60	80.54	72.11	90.00	62.00	74.75	1/3	....	....	.	29.29	29.28	29.27	29.50
38	Somerset,	Somerset,	George Mowry,	62.79	74.31	63.20	83.50	51.50	66.77	4/3	44.00	56.76	.	27.93	27.93	27.95	28.10
39	Indiana,	Indiana,	Richard White,	73.71	79.13	66.84	90.00	57.00	73.23	.	59.00	59.60	.	28.70	28.68	28.70	28.90
40	Jefferson,	Rose Cottage,	C. C. Gaskell,														
41	Warren,	Warren,	C. S. Brown,	66.26	76.52	72.89	85.50	54.00	71.89	.	53.00	65.71	.	28.92	28.91	28.91	29.15
42	Venango,	Franklin,	Wm. Connely,	57.81	84.55	66.16	102.	40.00	69.51	.	....	....	.	29.12	29.20	29.24	29.90
43	Armstrong,																
44	Westmoreland,																
45	Fayette,	Uniontown,	J. P. Weithers,	69.29	85.10	69.79	98.00	55.00	74.73	.	....	....	.	29.03	29.03	29.05	29.23
46	Green,																
47	Washington,	Cannonsburg,	A. H. Campbell,	64.81	77.94	70.58	88.00	53.00	71.11	.	50.00	61.47	3	29.13	29.16	29.15	29.40
48	Alleghany,	Pittsburgh,															
49	Beaver,	Beaver,	Wm. Allison,	69.06	83.79	71.94	95.00	60.00	74.93	2/3	....	....	.	29.50	29.48	29.47	29.75
50	Butler,	Butler,	Jacob Mechling,	66.26	80.00	72.35	90.00	56.00	72.87	.	....	....	.	28.91	28.90	28.90	29.10
51	Mercer,	West Greenfield,	S. Campbell,														
52	Crawford,	Meadville,	J. Limber,	71.48	78.62	69.13	88.00	60.00	73.08	1 1/3	50.00	62.55	.	28.82	28.82	28.82	29.02
53	Erie,	Erie,	Park & Reid,	71.21	76.42	69.03	91.00	55.00	72.22	.	48.00	60.23	.	29.41	29.43	29.43	29.66

Thermometer.								Barometer.								
					Register.											
	Maximum.	Minimum.	Mean.	Days omitted.	Lowest.	Mean.	Days omitted.	7, A. M.	2, P. M.	9, P. M.	Maximum.	Minimum.	Mean.	Days omitted.	Clear.	Cloudy.
3	88.00	66.00	75.89	1	58.00	67.14	9	30.11	30.14	30.13	30.43	29.79	30.13	$\frac{2}{3}$	$15\frac{2}{3}$	11
0	83.00	59.00	73.47	$\frac{1}{3}$	50.00	59.50	.	30.04	30.02	30.02	30.24	29.70	30.03	$\frac{2}{3}$	$19\frac{1}{3}$	$10\frac{2}{3}$
0	88.00	60.00	71.14	$1\frac{1}{3}$	....	....	.	29.97	29.96	29.95	30.18	29.60	29.96	$1\frac{1}{3}$	.	.
0	90.00	52.00	75.28	12	....	....	.	29.59	29.62	29.58	29.80	29.25	29.60	$11\frac{2}{3}$	$7\frac{2}{3}$	$11\frac{1}{3}$
5	87.00	46.00	68.17	.	46.00	58.55	.	29.60	29.60	29.60	29.84	29.24	29.60	$\frac{2}{3}$	17	$13\frac{2}{3}$
5	89.00	52.00	69.71	17	50.00	58.12	23	28.89	28.91	28.89	29.05	28.60	28.90	17	.	.
9	94.00	58.00	71.13	.	44.00	59.00	.	28.12	28.12	28.12	28.35	27.70	28.12	.	22	9
0	86.00	56.00	72.54	3	...	...	.	29.92	29.89	29.88	30.10	29.56	29.90	3	$13\frac{2}{3}$	$14\frac{1}{3}$
6	88.00	59.00	74.26	$1\frac{1}{3}$	58.00	66.00	1	29.57	29.56	29.57	29.80	29.26	29.57	$\frac{2}{3}$	$17\frac{1}{3}$	$13\frac{2}{3}$
3	92.50	60.00	74.25	$\frac{2}{3}$	54.00	65.79	.	29.57	29.56	29.56	29.79	29.20	29.56	$\frac{2}{3}$	19	$11\frac{1}{3}$
5	90.00	63.00	77.34	1	59.00	68.60	1	29.78	29.79	29.79	29.97	29.50	29.79	1	.	.
2	89.00	63.00	73.69	$2\frac{2}{3}$	46.00	58.62	2	29.52	29.50	29.49	29.75	29.14	29.50	$2\frac{1}{3}$	13	$15\frac{1}{3}$
8	90.00	51.00	70.36	$3\frac{1}{3}$	....	....	.	29.54	29.48	29.52	29.73	29.16	29.51	$4\frac{2}{3}$	17	$9\frac{1}{3}$
5	94.00	53.75	73.88	.	50.00	61.64	.	29.45	29.44	29.44	29.65	29.17	29.45	.	21	$9\frac{2}{3}$
7	90.00	58.00	73.97	$\frac{2}{3}$	....	....	.	29.43	29.40	29.40	29.62	29.06	29.41	$\frac{2}{3}$	23	8
0	90.00	51.00	72.74	$7\frac{2}{3}$	....	....	.	29.33	29.32	29.30	29.50	29.02	29.32	$7\frac{2}{3}$	16	7
3	93.00	42.00	67.11	.	59.00	53.77	.	28.07	28.08	28.07	28.28	27.80	28.07	.	$12\frac{1}{3}$	$18\frac{2}{3}$
7	89.00	52.00	68.20	$3\frac{1}{3}$	44.00	55.59	4	28.00	27.99	27.98	28.22	27.70	27.99	$3\frac{1}{3}$	11	$14\frac{1}{3}$
1	90.00	62.00	74.75	$\frac{1}{3}$	....	....	.	29.29	29.28	29.27	29.50	28.94	29.28	$\frac{1}{3}$	15	$15\frac{2}{3}$
8	83.50	51.50	66.77	$\frac{2}{3}$	44.00	56.76	.	27.93	27.93	27.93	28.10	27.64	27.93	$\frac{2}{3}$	$11\frac{2}{3}$	$18\frac{2}{3}$
4	90.00	57.00	73.23	.	39.00	50.60	.	28.70	28.68	28.70	28.90	28.40	28.70	.	$19\frac{1}{3}$	$11\frac{2}{3}$
8	85.50	54.00	71.89	.	53.00	65.71	.	28.92	28.91	28.91	29.15	28.55	28.91	.	$20\frac{2}{3}$	10
5	102.	40.00	69.51	.	....	....	.	29.12	29.20	29.24	29.90	28.70	29.19	$16\frac{1}{3}$	$12\frac{1}{3}$	$2\frac{1}{3}$ 1
9	98.00	55.00	74.73	.	....	....	.	29.03	29.03	29.05	29.23	28.60	29.03	.	$24\frac{2}{3}$	$6\frac{1}{3}$
7	88.00	53.00	71.11	.	50.00	61.47	3	29.13	29.16	29.15	29.40	28.82	29.15	.	.	.
9	95.00	60.00	74.93	$\frac{2}{3}$	....	....	.	29.50	29.48	29.47	29.75	29.14	29.48	$\frac{2}{3}$	$18\frac{1}{3}$	$11\frac{2}{3}$
9	90.00	56.00	72.87	.	....	....	.	28.91	28.90	28.90	29.10	28.60	28.90	.	.	.
	88.00	60.00	73.08	$1\frac{1}{3}$	50.00	62.55	.	28.82	28.82	28.82	29.02	28.48	28.82	$1\frac{1}{3}$	$15\frac{2}{3}$	14
	91.00	55.00	72.22	.	48.00	60.23	.	29.41	29.43	29.43	29.66	29.04	29.42	.	18	13

		Weather.								Winds.																Hygrometer.					
	Days omitted.	Clear.	Cloudy.	Days omitted.	Rain.	Snow.	Rain and Snow.	Thunder Showers.	Rain in inches.	North.	N. N. E.	N. E.	E. N. E.	East.	E. S. E.	S. E.	S. S. E.	South.	S. S. W.	S. W.	W. S. W.	West.	W. N. W.	N. W.	N. N. W.	Calm.	Days omitted.	Dew-point.	Days omitted.	Diff. therm. and dew point.	Wet Bulb.	Days omitted.	No. of Report.
3	2	15	11	4	....	....	....	..	....	1	1	2	1	2	1	1		4	2	5	1	2	1	4	2	.	1	....	.	... .	....	.	1182
3		19	10	1	7	....	....	..	3.983		.	5	.			1				1	1	8	.	1		8	.	.	1	....	.	.....	....	.	1176
6	1	.	.	.	....	....	....	..	.....	1	.	2	.	3	.	4	.	.	.	8	.	.	.	8	.	.	4	....	.	.. ..	....	.	1164
0	11	7	11	12	10	....	....	..	4.770	1	.	.	.	2	1	1	.	2	.	4	.	7	1	2	.	.	7	....	.	.....	....	.	1174
0		17	13		10	....	....	..	3.658	1	.	1		1	.	3		7		6	.	3	.	3			1	....	.	.....	....	.	1159
0	17	.	.	.	....	....	....	..	.....	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	....	.	.....	....	.	1173
2	.	22	9	.	7	....	....	..	2.510	.	.	2			.	2				.	.	3	.	7		6	.	....	.	.....	....	.	1205
0	3	13	14	3	5	....	....	1	2.630	.	.	2	.	2		1		1	.	4	.	3	3	10	.		3	....	.	.....	....	.	1158
7		17	13	.	4	....	....	..	3.229	1		3		1		1		2	3	5		2		6		.	2	60.04	1	.....	....	.	1171
6		19	11		5	....	....	..	1.530	2	1	2			.	2	2	6	1	2	1			6		.		68.08	2	.....	70.74	2	1181
9	1	.	.	.	....	. ..	....	..	.....	3	.	.	.		.	3	.	4	.	5	.	6	.	7	.	.	1	63.20	1	.....	....	.	1150
0	2	13	15	2	7	....	....	3	1.937	1		3	.		.	3	.	8	.	.	.	5		5		1	2	....	.	.....	72.14	3	1151
	4	17	9	4	....	....	....	..	.....	.	.		.		.	2	.		.	3	.	2	.	2	.	15	4	....	.	.....	....	.	1180
5	.	21	9		5	....	....	..	0.998	4	.		.	2	.	.		4	1	4	.	5	1	1	.	5		....	.	.....	....	.	1212
		23	8	.	4	....	....	..	0.942	.	.	.	.	9	.	.	.	.	.	.	.	21	.	.	.	.		....	.	.....	....	.	1192
2	7	16	7	8	5	....	....	..	3.527	2	.			.		1		1	.	3		4		3	.	4	8	....	.	.....	....	.	1168
	.	12	18	.	6	....	....	..	2.400		.	.	.	7	.	2	.		.	2	.	13	.	2	.	.	2	....	.	.....	75.57	1	1204
3		11	14	5	9	....	....	..	3.229	.	.		.		.		1	1		2	1	5		6	1	6	3	....	.	.....	...	.	1154
		15	15		....	....	....	..	.....	.	.	.	.		.	4		.	2	2	6	1	11	1		.		....	.	.. .	....	.	1152
		11	18		6	...	....	1	3.350		.		.			1		1	.	4	1	4		11	1			....	.	.....	....	.	1161
	.	19	11	.	10	....	....	..	3.900	.	.	.	.		.	2	.		.	4	.	6	.	5	.	12		....	.	...	....	.	1163
	.	20	10		6	....	...	..	3.849		.		.	.	.	2	1		1	8	.		.	2	.	14	.	....	.	....	....	.	1169
16		12	2	16	4	....	....	..	2.158	.	.		.	.	.	4	.	.	.		.	.	.	9	.	.	16	....	.	.....	....	.	1162
	.	24	6	.	....	....	....	..	.....		.		.	.	.	3	.	2	.	10	.	5	.	4	.	4	.	....	.	.....	....	.	1269
	.	.	.	.	7	....	....	..	3.772			3	.	1	.		.	1	.	3	.	10		3	.	6		65.03	11	.....	70.11	13	1157
		18	11	1	6	....	....	..	1.810		.	3	.	.	.	1	.	.	.	1		1	1	13	.	9		....	.	.....	....	.	1229
	.	.	.	.	7	...	....	..	2.399	.	.	.	.	10	.	1	.			2	.	14	.	2	.	.	.	....	.	.....	....	.	1153
1		15	14	1	8	....	....	1	4.054	1	.	.	.	.	.			8		4	.	5		6	.	2	1	....	.	.....	....	.	1170
	.	18	13	.	9	....	....	..	3.262	1		4	.		.		1	3		2		5	2	3	.	4	.	....	.	.....	....	.	1179